INDEX TO ADVERTISERS AND CONTENTS ON PAGE 30.

THE FOUNDRY

Vol. 18. *CLEVELAND, OHIO, APRIL, 1901.* *No. 104.*

PUBLISHED MONTHLY BY
THE IRON AND STEEL PRESS CO.
ROSE BLDG., CLEVELAND, OHIO.

G. H. GARDNER, PRESIDENT AND TREASURER.
JOHN A. PENTON, VICE-PRESIDENT.
A. I. FINDLEY, SECRETARY.

JOHN A. PENTON. - - - - - - - Editor.
HENRY HANSEN. - - - - - Associate Editor.

CLEVELAND, OHIO: 1064 Rose Building.
CHICAGO, ILL.: 1522 Monadnock Building.
PITTSBURG, PA.: 429 Park Building.
PHILADELPHIA, PA.: 908 Rothschild Building.
DETROIT, MICH.: Hammond Building.

The subscription price of THE FOUNDRY is $1.00 a year to points in the United States, Canada and Mexico. $1.75 to all other countries.

THE FOUNDRY has but one advertising rate, which will be found printed in each issue.

Practical articles, pertaining to the trade in all its branches, are solicited and will be paid for.

We can begin subscriptions with the current number only.

Application has been made for entry as second class matter at the Post-Office at Cleveland, Ohio.

Trade Outlook.

The number of new foundries and extensions of old ones which we are recording from month to month is good evidence that the foundry business is continuing at least at a normal rate. Responding to the increased demand, peculiar to this time of the year, prices are advancing.

No disturbing influences to the foundry trade in general have so far matured. In certain quarters the machinists are reported as intending to present new demands upon their employers and to make an effort to force those outside of the National Metal Trades Association to grant the same terms as the members of the latter organization. How far an extensive move of this kind would affect the foundries can only be surmised.

The settlement of the molders' strike at Cleveland, Ohio, and the ratification of an agreement between the foundrymen of Philadelphia who are members of the National Founders' Association and the molders of that city, brightens the entire outlook in two leading centers.

Touching upon general conditions in the iron trade, Rogers, Brown & Co. say in a recent review of same:

"The question is being asked by producers and consumers alike as to the trend of trade and prices, and buyers who will soon be needing iron are wondering whether to buy in anticipation of requirements or wait. Many feel that as present prices of pig iron give the maker a very slender margin of profit, and as the prices are conservatively low, there is no risk in providing for known requirements, especially if they can be assured of securing their chosen brands, and enabled to maintain their familiar mixtures, and such are buying without hesitation. The casting of the horoscope as to prices of pig iron has rarely resulted in an infallible prediction. It is reasonable to suppose that the curtailment of exports of iron and steel and their products will be counter-balanced by heavy expansion of domestic trade and home consumption, so that it is felt there will be a demand for the normal output of the furnaces throughout the year."

Matthew Addy & Co. say:

"One of the most interesting features of the pig iron situation lately is the demand for pig iron for shipment over the last half of the year. There have been considerable sales made for these deliveries. Naturally purchases of this kind have thus far been mainly confined to the very large consumers. While of course we have no absolutely accurate information in regard to these purchases, yet in a general way it is understood that they have been against contracts taken by the buyers who propose to take no chances on a rising market. Thus far there has been no speculative buying whatever. The demand has come from the actual needs of the consumers. They put off buying until the last moment. In December and January there was a curious impression abroad in regard to the stocks of Southern iron. Many consumers seemed to think that there was an unlimited quantity of iron in the South and that prices

were going back to the '98 standard. The buying movement had not lasted a week until both of these ideas were dissipated. In certain of the soft grades of Southern foundry iron there is decided shortage, while there is no accumulation of any grade that is worth mentioning. In fact the Southern order books are now practically filled for the first half of the year, or through May in all cases."

Foundry of the O. S. Kelly Co., Springfield, O.

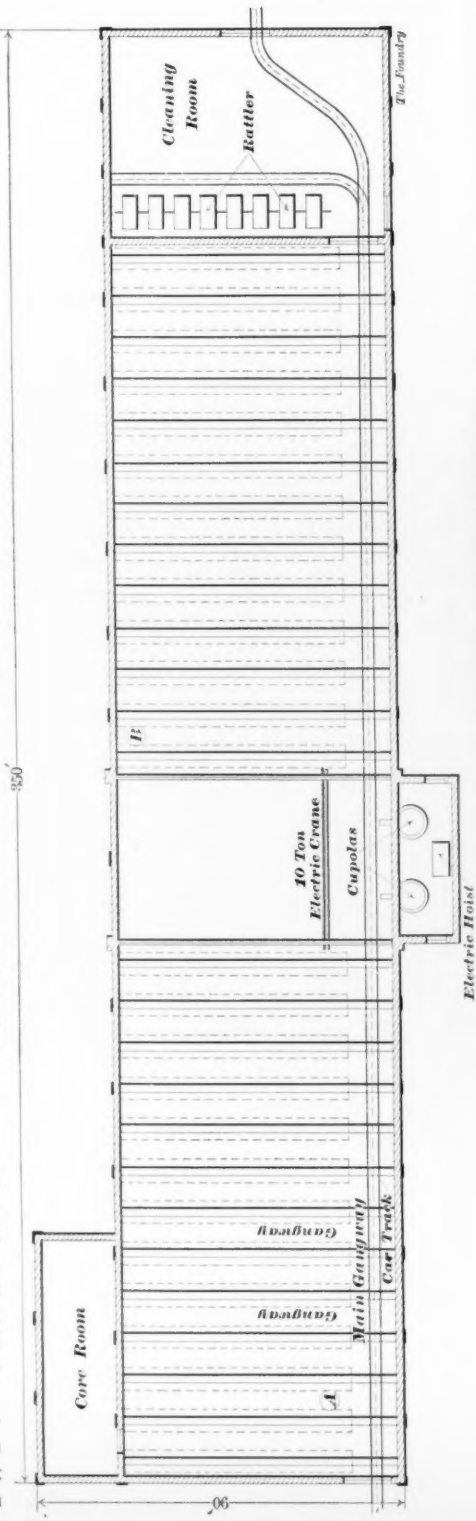
It is but seldom that we find a specialty shop also well equipped for general work and the whole thing under one roof.

The O. S. Kelly Co. of Springfield, Ohio, some time ago built the foundry of which we show the plan and general arrangement in the attached illustration. The design and structural work was furnished by the Rogers Iron Co. of the same city.

The main output from this foundry is piano plates. The full lines running across the building represent the tracks for the two-ton cranes serving each floor, of which there are twenty-six, each capable of containing eight piano plate molds. The dotted lines on each side of the tracks represent the space covered by each floor when filled with molds.

As will be noticed from the half tone illustration A, the entire system of small cranes and also the ten-ton crane for general work are suspended from the steel roof trusses, which rest on brick walls. There is not a column in the whole foundry.

A and B show the two positions from which the accompanying photographs are taken. At this plant the piano plates are cleaned in specially built tumbling barrels or rattlers, thus requiring but a minimum of manual labor before being ready for shipment.



Plan of the O. S. Kelly Co.'s Foundry at Springfield, Ohio.

The Settlement at Cleveland.

After a battle lasting seven months and a half the Iron Molders' Union and the members of the National Founders' Association agreed on February 15 to end the strike at Cleveland, Ohio. Both sides handled their forces with perfect discipline, as is shown by the fact that of the 596 molders and apprentices involved not one returned to work until after a settlement was made.

Following closely upon cessation of hostilities at Cleveland, the Philadelphia foundrymen and molders also made terms by which work will be continued without interruption. In

order that our readers may judge for themselves what has been accomplished, we print the text of both of these agreements.

CLEVELAND AGREEMENT.

1. That the Iron Molders' Union of North America shall declare the strike off, and cease immediately to picket the foundries of the city, the men's boarding houses and homes, and cooperate with the foundrymen of Cleveland and Lorain in the operation of their foundries.

2. The contracts now in force between the foundrymen of Cleveland and Lorain and their employes shall be completed in good faith, but no more contracts shall be made for the foundrymen of Cleveland and Lorain unless in case of strike. The National Founders' Association shall discontinue at once advertising for or engaging molders for Cleveland or Lorain foundries, and give notice as provided in the contracts for the discontinuance of the bonus, and the National Founders' Association agree not to support any members who refuse to comply with the terms of this agreement. The National Founders' Association will not require over forty days for the disposition of the men now employed. As fast as the present employes leave and any shop is vacated, the Iron Molders' Union of North America agrees to have that shop immediately filled with its members, and the Cleveland and Lorain foundrymen agree to accept the same to the number required by the foundrymen in the operation of their foundries, and work started, the selection of the men to be left to the foundrymen. These men need not of necessity be former employes.

3. The Iron Molders' Union of North America to notify their men to apply for work at once and make engagements for the time they are to return to work based on one day's notice, said notice to be sent to the men required by the foundryman as soon as the foundryman has his work, patterns and shop in readiness. If there is a failure on the part of the Iron Molders' Union to have the molders' return to work, then the Cleveland foundrymen are to engage such molders as are satisfactory to themselves, and the Iron Molders' Union agrees not to support its members if they refuse to obey the

A.—FOUNDRY OF THE O. S. KELLY CO., SPRINGFIELD, O.

Electric Hoist
Plan of the O. S. Kelly Co's Foundry at Springfield, Ohio.

orders of the president to return to work under the terms of this agreement.

4. That the minimum rate of wages shall be 27½ cents per hour for floor and bench molders, and any man returning to his former employer shall be paid at the same rate of wages he received prior to July 1, 1900, less 10 cents per day. And over time shall be paid for at the rate of time and one-half, except in case of accident or cause beyond control consuming not over thirty minutes, and double time for Sundays and legal holidays, to wit: Fourth of July, Thanksgiving, Christmas and Labor Day.

5. That the further adjustment of wages shall be by means of an agreement negotiated on June 3, 1901, for one year thereafter, and shall conform to any joint resolutions and agreements adopted by this conference on that subject.

6. That each foundryman shall take back all of his own apprentices, and each apprentice shall return to his former employer.

7. That the arbitrary limitation of output on the part of the molders, or arbitrary demands for an increase in the output of the molder on the part of the foundryman, not being in accord with the spirit of equity which should govern the relationship of employer and employe, all attempts in that direction are to be viewed with disfavor.

8. That the right of the foundryman to introduce or operate molding machines in his foundry shall not be questioned. In determining who shall operate them regard should be given to the question of how their best possibilities can be brought out and how the work can be most economically produced.

9. That the work shall commence promptly at the hour from which wages are calculated.

10. That other questions which have been the cause of friction and bad feeling between the employers and employes of the Cleveland and Lorain foundries are to be the subject of further investigation and correction, when such abuse is found to exist, the object of this being to bring into closer relationship employer and employe, so that their mutual interests may be protected. And further, that the investigation and removal of the abuses that the foundrymen complain of are to be the subject of a rigid investigation by the president and vice president of the Iron Molders' Union, with the understanding that they will see that said abuses cease.

11. The details above mentioned, together with any disputes relating to their adjustment,

B.—FOUNDRY OF THE O. S. KELLY CO., SPRINGFIELD, O.

are to be settled by the presidents of the respective associations, or such person or persons as they may designate.

12. The foregoing agreement applies only to the following foundries now on strike, but in those cases in which only a small per cent of the molders employed by any of the foundries was involved in the present strike, it is to be understood that the terms of this agreement shall only apply to that per cent: American Shipbuilding Co., City Foundry Co., Cleveland Steel Casting Co., Fulton Foundry Co., Kilby Manufacturing Co., Lorain Foundry Co., Maher Wheel & Foundry Co., McBeth & Co., Otis Steel Co., Palmers & DeMooy Foundry Co., Patterson Foundry Co., Riverside Foundry Co., United States Cast Iron Pipe & Foundry Co., Variety Iron Works Co.

PHILADELPHIA AGREEMENT.

ARTICLE I. In view of the fact that there has been an agreement entered into at the recent conference in Cleveland, Ohio, between representatives of both associations, on the question of equitable wage rates for molders, and in view of the mutual understanding that there is to be a further conference on the subject within a reasonable time—as may be agreed upon by the presidents of the respective associations—for the purpose of further perfecting the details regarding the regulation of wages of molders: It is agreed that the temporary agreement, entered into July 16th, 1900, shall be null and void, and that the agreement herein contained shall supersede the above mentioned temporary agreement.

ARTICLE II. The iron molders, members of the Philadelphia Union of the Iron Molders' Union of North America, agree to withdraw their demands that the foundrymen of Philadelphia should operate their foundries under the rules and regulations of the union.

ARTICLE III. In accordance with the National agreement, entered into at the recent conference in Cleveland, on the regulation of molders' wages, the foundrymen of Philadelphia who are members of the National Founders' Association, and the molders of Philadelphia who are members of the Iron Molders' Union of North America, agree to the following wage scale:

The standard minimum wage rate for bench and floor molders who have learned the general trade of molding shall be twenty-seven and one-half (27½) cents per hour, or sixteen dollars and fifty cents ($16.50) per week of sixty (60) hours, it being understood that when a molder has completed his work before regular shop closing time, such time shall not be deducted in computing the week of sixty (60) hours.

ARTICLE IV. The standard minimum wage rate shall be subject to the following differentials:

1st. The young man who has completed his apprenticeship and who, by reason of his mechanical inferiority or lack of experience, or both, in either branch of the trade of molding shall be unfitted to receive the full wage rate provided for above, shall be free to make such arrangements as to wages with his employer for a period mutually satisfactory as may be agreeable to himself and employer.

2nd. The molder who, by reason of his physical incapacity or physical infirmity, cannot earn the standard minimum wage rate is to be free to make such arrangements as to wages as may be mutually satisfactory to the employer and himself.

3rd. There being in some foundries a grade of work calling for less skill than is required by the ordinary molder, this grade of work being limited in quantity, it is agreed that nothing in this agreement shall be construed as prohibiting the foundrymen from employing a molder to make such work and paying for same at a rate that may be mutually agreed upon between the molder and foundrymen. It is understood that a molder who is working for and receiving a rate of wages of twenty-seven and one-half (27½) cents per hour, or over, is not to be asked or expected to make the grade of work referred to above for any less wage rate than he is regularly entitled to under this agreement. This does not give the molder the right to refuse to make the work if it is offered to him at his regular wage rate.

ARTICLE V. It is agreed that nothing in the foregoing shall be construed as prohibiting piece or premium work, and when it is desired on the part of the foundryman that his work shall be done under the piece work or premium system, it is agreed that the wages of the molder shall be based so that he may earn a wage not less than if working by the day. This is understood as applying to molders who are competent to do an equal amount of work and of equal quality to the average molder in the foundry in which he is employed.

Where the foundryman and molder can not agree on the piece price for a certain piece of work, the foundryman is to have the work done by the day for a period of a day or more, according to the nature of the work, in order

to establish a fair and equitable wage rate on the work in question.

It is further agreed that nothing in this agreement shall be construed as preventing a molder from agreeing with his employer on a piece price as soon as he is given a pattern.

ARTICLE VI. Time and half time shall be paid for all overtime excepting in cases of accident or causes beyond control consuming not more than thirty (30) minutes; and double time for Sundays and legal holidays, to wit: Fourth of July, Labor Day, Thanksgiving Day and Christmas. It being further understood that when foundries do not make a practice of running beyond bell or whistle time and are occasionally late, the "give and take" system shall apply in all such cases, it being understood that both sides should show a spirit of fairness in adjusting matters of this kind.

ARTICLE VII. Arbitrary limitations of output on the part of molders, or abitrary demands for an excessive amount of output by the molders on the part of the foundryman, being contrary to the spirit of equity which should govern the relationship of employer and employe, all attempts in that direction by either party, the molder or foundryman, are to be viewed with disfavor and will not receive the support of either of the respective associations parties to this agreement.

It being further agreed that the wage rates specified herein are to be paid for a fair and honest day's work on the part of the molder and that in the case of a molder feeling that a wrong has been done him by his employer, and that his treatment has been at variance with the terms of this agreement, he shall first endeavor to have the same corrected by a personal interview with his employer, and, failing in this, then he shall report same to the proper channel of his local union for its investigation. If there is any objectionable action on the part of the molder which is in conflict with this agreement or the spirit thereof, then the employer is to endeavor to point out to the molder where he is wrong, and failing in this, he may discharge the man for breach of discipline, or else retain him in his service and submit the case to the National Founders' Association for investigation.

In order that there may be no misunderstanding as to the wages a molder is to receive under the above agreement, it is understood that a molder must agree with the employer on the rate of wages that he is to receive at the time he is engaged; it being further agreed that neither the molder nor the foundryman is to deviate from the terms of this agreement as to wages or deportment.

ARTICLE VIII. In conformity with the agreement adopted at the recent conference in the city of Cleveland, the National Founders' Association and the Iron Molders' Union of North America, deprecate strikes and lockouts, and desire to discourage such drastic measures among the members of their respective associations.

It is therefore agreed that all unfair or unjust shop practices on the part of molders or foundrymen are to be viewed with disfavor by the Iron Molders' Union of North America and the National Founders' Association, and any attempt on the part of either party to this agreement to force any unfair or unjust practice upon the other is to be the subject of rigid investigation by the officers of the respective associations, and if upon careful investigation such charges are sustained against the party complained of, then said party is to be subject to discipline according to the by-laws of the respective associations.

And it is further agreed that all disputes which can not be settled amicably between the employer and molder shall be submitted to arbitration under the "New York agreement."

ARTICLE IX. When the words "employer" and "foundryman" are used, it is understood that their foreman or representatives may carry out the provisions of this agreement and act for them.

ARTICLE X. It is further agreed that nothing in the foregoing shall be construed as applying to operators of molding machines who have not learned the general trade of molding, and the right of a foundryman to introduce molding machines in his factory shall not be questioned.

ARTICLE XI. This agreement shall continue in force to July 16th, 1901, and thereafter to June 3rd, 1902, and to continue from year to year, from June 3rd, 1902, unless notice be given on May 1st of any year by either party to this agreement signifying their desire to change or modify the conditions of this agreement.

And it is further agreed that should any agreement be reached by a conference of representatives of the National Founders' Association and the Iron Molders' Union of North America upon the question of wage rates for molders, and in conflict with the terms of this agreement, a conference of the parties hereto shall be called immediately to conform the terms of this agreement to those of the National agreement; otherwise this agreement is to continue in force as above provided.

The Hanna Portable Pneumatic Screen Shaker.

Our readers will probably already have noticed an advertisement of this machine appearing in our columns and we take pleasure in presenting some shop illustrations, showing the handiness with which it may be transported and operated.

Our first illustration shows what is called the Post Type of this machine in a portion of the core room at the Gates Iron Works, Chicago. As will be noticed, the Hanna Shaker takes an ordinary foundry riddle and as these may be changed in the fraction of a minute the molder or coremaker can instantly be supplied with sand of such a fineness as will best suit his work.

The second illustration shows a portable machine on one of the molding floors in the foundry of the Gates Iron Works. As is shown the riddled sand is delivered right where it is wanted.

Our last illustration shows the same type of machine in the foundry of the Link Belt Machinery Co., Chicago. In riddling half-inch sand, of which there is generally a large quantity used on jobs of this kind, it is calculated that the machine will take care of all that two men can shovel. Of course, the molder's helper can move the machine to whatever position it will be easiest for him to supply the molder and needs only to keep it in operation as long as necessary. Through a one-fourth inch mesh the machine will sift as fast as one man should shovel.

It is well known to every practical foundryman that the greater portion of the sand sifting done in the foundry must be performed right on the floor, as it would be impracticable to wheel the sand forwards and backwards for large molds. The molders are often found waiting because the helpers can not supply them fast enough, and a machine of this type will tend to expedite matters and permit of the molder being waited upon promptly.

FIG. 1.—THE HANNA PORTABLE SCREEN SHAKER IN THE CORE ROOM OF THE GATES IRON WORKS, CHICAGO.

The Kranks' Korner.

The flux fakirs of Mexico, also known as the National Ore and Reduction Co. of Durango, Mexico, have, according to the latest literature they are dumping across the border, caught another innocent citizen to act as their agent for Wisconsin and Minnesota. His name is C. L. Bauman, and he is supposed to reside at 811-812 Phœnix Building, Minneapolis, Minn.

* * *

Just what inducements were offered to Mr. Bauman to act as the agent for a concern whose principal work has been to skin a few people who did not know anything about the foundry business is more than we can say; but

if Mr. Bauman has got sufficient brains to keep the courts from appointing a guardian for him he will not represent these Mexican swindlers very long. According to one of their latest circulars, they have during the past two years supplied 2972 shops with their nickel manganese calcium fluoride. If this is so, there are certainly more fools engaged in the foundry business than I ever thought possible.

* * *

There are ninety-three foundries in Minnesota and one hundred and ninety-five in Wisconsin. I am sure that but few of these shops are run by men who will be stupid enough to pay ten cents a pound for blast furnace slag to soften their iron.

I am bothered every now and then by people who write me wanting to know how to make steel castings in their cupola. As a general rule, they want me to tell them what kind of pig iron is used for steel castings, what kind of flux, and how much coke is used for the bed. Most of these inquiries come from the back-woods foundries which melt about nine hundred pounds of iron per month, and whose chief trade is to supply the farmer with broken cultivator castings and stove legs. The following letter from the State of Maine is, however, the first one which has asked me to tell how to run a foundry. There is a charming frankness about it that commands attention, and for fear that too many readers will want to help the writer out, his address and name are omitted. The balance is as follows:

"I am thinking of starting an iron foundry and I don't know enough about the business to go ahead. I wrote to the publishers of 'Farm & Factory' for some ideas, and they recommended that I write to you. What I want to know is how to build a furnace and line it, how to arrange for the blast or wind, and how big a blower to use. I also want to know how much coal and what kind to use to so many pounds of iron, how to make the cores and do the molding and tempering the iron. How much old and new iron to use together and the chilling of the iron and everything used inside and around an iron foundry, making the flasks and all."

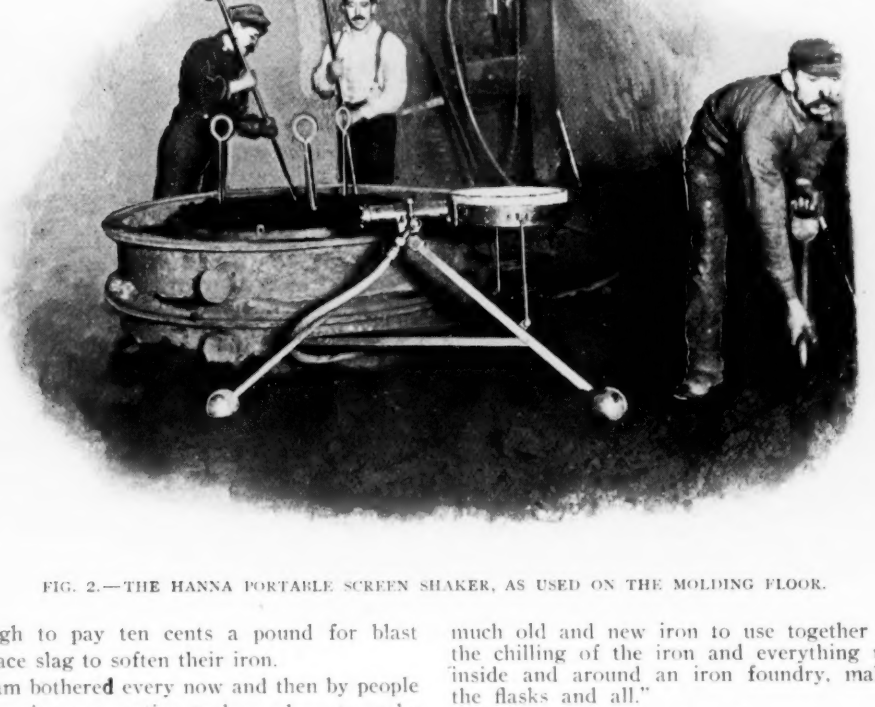


FIG. 2.—THE HANNA PORTABLE SCREEN SHAKER, AS USED ON THE MOLDING FLOOR.

* * *

This is certainly asking questions with a vengeance, and I am afraid that my answer was rather disappointing from the receiver's standpoint.

* * *

Walter J. May writes the following to an English journal concerning the venting of awkward cores:

"In many cases where small work is con-

cerned the venting of the cores is most difficult, and the old device of using string, straw, and the like proves unsatisfactory, while wax tapers, as often used, do not prove satisfactory unless the cores are made hot enough to burn out the threads. Burnt cores become rotten, and for many purposes are useless, while in every case their use is open to doubt, as portions are liable to be carried off by the flow of metal, and so cause faults in the casting in which they are used. A sound core is always a strong factor in casting work, and while sound the removal of gases is a prime necessity, or there is a great chance of the casting being unsound. The venting should also be done so that the metal does not run into the air passages, for although in a straight core this may not prove very serious, owing to the accessibility of the opening to the use of a drill or other tool, with, say, one of the port cores of a steam cylinder the case would be very different. The writer has more than once seen a casting spoiled because a core has been so vented as to permit the metal breaking through in some inaccessible part of a core, and not only causing a projection on the casting, but also fusing the strengthening wire, and making it impossible to get the core out thoroughly, and making the casting useless. To remedy this it is necessary to have the venting apertures at a sufficient distance from the outside of the core (often in the centers of thin cores), and it is also desirable that the venting material should be bedded in the core during its manufacture, and as far as possible dissolve out in the drying process. At present, to the writer's knowledge, there is only one material which fills the requirements—Gibb's wax wire; but possibly other materials could be found if sought for. The one in question is a strand of hemp or cotton, covered with some composition of a waxy character, which melts at a comparatively low heat, and either runs out from, or is absorbed by, the core, leaving a clear passage in which only the thread is left, without in any way altering the position in which it was placed. Being very flexible, it will make acute angles without impairing the efficiency or size of the gas passage, and thus renders the risk of the metal breaking through quite impossible. It may be well to say that this wax wire is made in sizes from 1-16th inch to 1-2 inch in diameter.

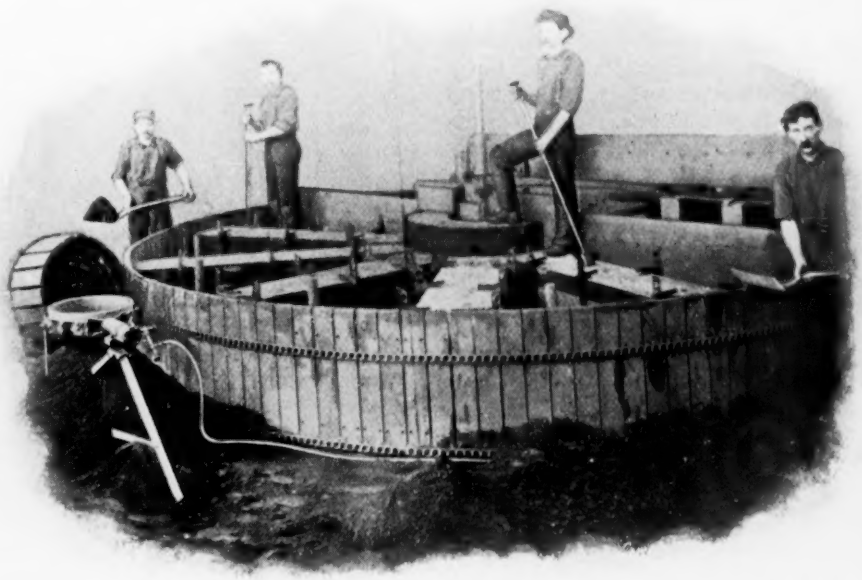


FIG. 3.—THE HANNA PORTABLE SCREEN SHAKER AT THE FOUNDRY OF THE LINK BELT MACHINERY CO., CHICAGO.

There, however, appears to be an improvement to be made if the thread could be done away with, and those interested in foundry work have still a field for experiment open to them, particularly if some other substance could be found to answer the purpose, and which would completely volatilize at the ordinary heat found in the core oven."

* * *

The main trouble in venting awkward cores is not overcome by Gibb's wax wire or any other contrivance. What a very large number of foundrymen have yet got to learn is that there is a difference between light and heavy

cores and that the materials that are suited for one are not the proper things for the other.

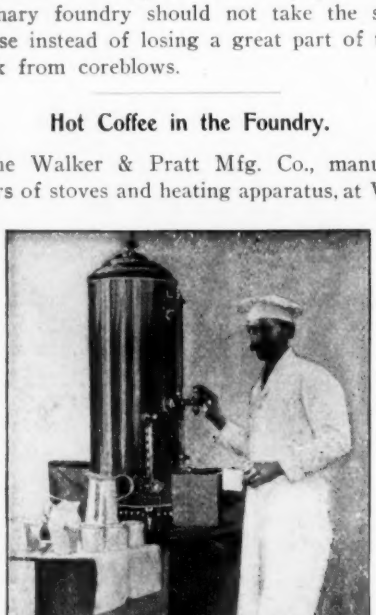
* * *

The average jobbing foundry has a holy terror of a time whenever a light, crooked core has to be made. This is because they slap the same clayey stuff they use for chunky cores into the light one and expect it to answer the purpose. I have heard old experienced foremen say that all they wanted to make cores for any job was flour and clay wash, and I have always noticed that they lost an unusual percentage of their cored castings. What is wanted for light cores is a clean, sharp sand and for a binder some core compound which does not produce the amount of gas that flour does nor blocks the passages like claywash. Such a mixture does not amount to much for heavy work, as it will not support itself while being dried, but for light, complicated cores it is the only thing to use. Very little venting if any is needed.

Shops making a specialty of castings requiring complicated cores make a study of these things and find by experience what will do them the most good. It is strange that the ordinary foundry should not take the same course instead of losing a great part of their work from coreblows.

Hot Coffee in the Foundry.

The Walker & Pratt Mfg. Co., manufacturers of stoves and heating apparatus, at Watertown, Mass., are furnishing hot coffee to their employes during the noon hour. Strip tickets are sold at the rate of twelve for twenty-five cents, which covers the cost of the materials used, the company supplying the necessary help, and gas for heating the coffee, at its own expense.



SERVING COFFEE TO EMPLOYES.
Walker & Pratt Mfg. Co., Watertown, Mass.

SERVING COFFEE TO EMPLOYES.
Walker & Pratt Mfg. Co., Watertown, Mass.

The mugs used hold a pint each, and are of sheet steel white enameled inside and out. The company has installed a first-class nickel-plated automatic urn, steam jacketed, heated by gas. The men in charge are dressed in white coats, aprons and caps, as shown in the illustrations. The molders and other workmen are allowed to come to the urn, if they desire, and mix their coffee for themselves in any way they prefer it, but for the convenience of the molders, a boy goes through the foundry at frequent intervals during the noon hour, carrying a covered pail of coffee mixed with the proper amount of milk and sugar, also a neat nickel-plated iron tray containing two dozen mugs. The pail, or carrier, used is insulated to retain the heat, and as the boy makes trips at intervals of about eight or ten minutes the men are served with coffee boiling hot.

The Walker & Pratt Mfg. Co. extends an invitation to all foundrymen who are interested to visit them and sample this new product of the company, which, like all the productions made in this foundry, is said to be of supreme excellence.

Cast Iron Car Wheels.*

The Interstate Commerce Commission, in its report of June 30, 1899, gives the number of cars and locomotives in use in the United States, as follows: Locomotives, 36,234; coaches, 33,595, and freight cars, 1,248,826. Taking eight wheels to each freight car, and allowing 50 per cent of the wheels under coaches and locomotives for steel tired and designs other than the cast iron wheel, there are in use at the present time 10,269,924 cast iron wheels. Taking into consideration the small amount of damage done, due to the failure of the cast iron wheel, it would almost seem that the manufacture of the cast iron wheel has been brought down to a science. Undoubtedly a persistency in the use of the drop and thermal test has been productive in bringing about these favorable results. A prominent wheel manufacturer made the remark recently that close inspection and tests had been leading factors in lifting him out of a rut in which he would doubtless have remained had it not been for inspection and tests.

A number of manufacturers of cast iron wheels have made quite a protest against the thermal test, assuming that, in making wheels to meet this test they would do so at a sacrifice of the wearing qualities. While the adoption of the thermal test does not date back far enough to give correct data on the subject, we think there is no reason for this anxiety on the part of the manufacturer regarding loss in wear in wheels made to stand thermel test specifications, provided the thermal test specified is a reasonable one. For the fact is conceded that, no matter what may be done with a car wheel, some extraordinary conditions may arise which will break it.

The thermal test specifications as required by the Chicago, Burlington & Quincy are as follows:

"The test wheel must be laid flange down in the sand and a channelway 1⅛ inches wide and 4 inches deep must be molded with green sand around the wheel. The clean tread of the wheel must form one side of the channelway and the clear flange must form the bottom. (It will be noted that the width of the channelway is equal to the height of the flange, namely 1⅛ inches). The channelway must be filled to the top with molten cast iron, which must be poured with two ladles directly into the channelway. The molten iron must be taken from the big ladle directly after a tap for pouring wheels has been drawn from the cupola. The channelway must be filled with the molten iron in no greater time than one minute after the iron has been taken from the big ladle. No puddling or cooling of the iron will be allowed. If the molten iron boils in the ladles, they must be refilled until all indications of boiling cease before the channelway is filled. The time when the pouring ceases must be noted, and two minutes later an examination must be made, and if the wheel is found cracked in the plates or through the thread, the wheels represented by the test wheel will be rejected. Wheels that are wet or have been exposed to the frost may be warmed sufficiently to dry or remove frost before testing. Fig. 1 shows the method of pouring the thermal test.

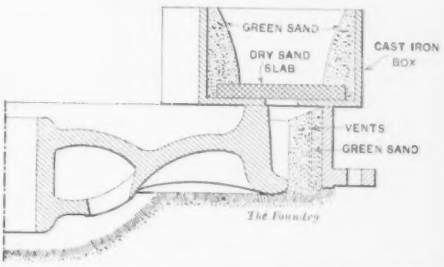


FIG. 1.—THE THERMAL TEST FOR CAR WHEELS.

"In addition to the above, the following recommendation is made, namely: 'That at the option of the manufacturer, if the test wheel fails under this thermal test, a second wheel showing the next lower shrinkage size, to the wheel which failed and cast on the same date as the failed wheel, may be selected by the inspector and used for test. If the second wheel stands the thermal test, all wheels of the same and all lower shrinkage sizes may be accepted, while the wheels of the same and higher shrinkage as the failed wheel must be rejected.'"

Wheels tested according to the above thermal test specifications, and in conjunction with the Barr drop test, will assure the railroads the greatest degree of safety in using cast iron wheels. The above recommendations are made for the following reasons, namely: The shrinkage allowed on a cast iron wheel is ½ inch, ¼ inch above and ¼ inch below the mean circumference, divided in four tape sizes of ⅛ inch. The tape No. 1, or highest shrinkage, are the weaker wheels, conditions being normal. The inspector being aware of this almost invariably selects the tape No. 1, or highest shrinkage number, for test. He is justified in so doing, for the first thing to consider in the inspection of wheels is the point of safety. If the tape No. 1 fails when in the thermal test, reject them, and allow the inspector to select one of the tape No. 2, or next lower shrinkage number, and if the second wheel fails, reject all of the wheels represented; providing, however, the second wheel stands the thermal test,

* From a paper read by G. W. Beebe before the Western Railway Club.

it seems hardly fair to the manufacturer to condemn the second and lower shrinkage numbers, the inspector being satisfied by test on the second tape sizes that they are sufficiently strong and are hard enough to give the wear.

An inspector should make a study of iron, so that he can readily designate at a glance whether the first wheel failing could be attributed to bad iron or abnormal conditions in the pitting or handling of the failed wheel. A wheel can be made of a hard, close grain iron that will stand the drop test or concussion in service, but if subjected to a severe and continued brake application is liable, as a boy says, "to go up in smoke." A gritty, hard chill will not make the mileage that a tough chilled wheel will. A gritty chill will shell out quicker than a tough one, because it will not stand the heat that is caused by severe brake application. Good white iron is tough, as well as being hard enough. There is as great difference in the quality of white iron as there is in gray iron; good white iron has a large proportion of combined carbon; bad white iron has a large proportion of sulphur. I believe the steel-tired wheel proves that the toughness gives the wear. I have not seen or heard of a steel-tired wheel shelling out. I have heard some railroad men say that when they can cut the chill of a wheel with a chisel, the wheel will not make good mileage. If this is the case, the steel wheel could not make the mileage that is claimed for it, because the steel-tired wheel is turned before being put into service, and it certainly must be soft in order that it can be turned. These hard, gritty wheels will fail in the thermal test, or by severe brake application.

The accompanying table shows a comparative record of tests made by the writer under the Barr drop, in 1893, as against tests made in 1900.

Test of Wheels Made in 1893—Barr Drop.

Wheel No. 000, tape 2—weight 585 pounds; diameter 33 ins.—Number of blows to break.....14
Wheel No. 000, tape 2—weight 585 pounds; diameter 33 ins.—Number of blows to break.....21
Wheel No. 000, tape 2—weight 585 pounds; diameter 33 ins.—Number of blows to break.....37
General average of blows to break.....24

Test of Wheels Made in 1900—Barr Drop.

Wheel No. 000, tape 2—weight 585 pounds; diameter 33 ins.—Number of blows to break.....175
Wheel No. 000, tape 2—weight 585 pounds; diameter 33 ins.—Number of blows to break.....227
Wheel No. 000, tape 2—weight 585 pounds; diameter 33 ins.—Number of blows to break.....165
General average of blows to break.....165

The above wheels tested were made by the same manufacturer, and these tests certainly show a marked improvement in the strength of wheels made in 1900, as compared with those made seven years ago. Regarding the depth of chill, it should not exceed ¾ inch in the throat, or 15-16 inch in the center of the thread. The minimum should not be less than ¼ inch in the throat, or ⅜ inch in the center of the thread. Assuming that we have the maximum depth of chill, 15-16 inch, we get the blending of the white iron through the entire tread and begin to crowd the danger line, and gain nothing thereby. A highly chilled wheel will shell out and become comby by sliding more readily than a medium chilled wheel. In breaking up 300 defective wheels that were removed on account of shelled spots, 95 per cent showed a high chill.

The design of a pattern is one of the essential factors in the manufacture of the cast wheel, other than the thickness of flange, shape of hub and tread. The designing of the pattern should be left to the discretion of the manufacturer. A large percentage of wheels that fail in the brackets can be ascribed to a poorly designed pattern; too light brackets will crack because they cool more rapidly than the plate of the wheel, which would cause a strain on them; too heavy a bracket will throw the strain on the plates, causing the plates to crack

For those who are not familiar with the drop test used in testing wheels, Fig. 2 gives an illustration of the Barr drop, and Fig. 3 the M. C. B. drop. It will be noted that the hammer of the Barr drop strikes the single plate of the wheel, see letter "A" on Fig. 2. The hammer of the M. C. B. drop strikes the hub of the wheel, see letter "A" on Fig. 3. A wheel rarely fails in service in the hub, double plates, or at the intersection of the plates, see letters "A," "B" and "C" on Fig. 3. If a crack does occur at these points it does not necessarily cause the wheel to become dangerous. If a crack occurs in the single plate, see letter "A" on Fig. 2, we then have a dangerous wheel and it will not run long before giving way entirely. It will be noted that wheels tested under the M. C. B. drop are placed flange downward on an anvil block, having three supports for the flange of the wheel to rest upon. The hammer strikes the central part or hub and the whole of the wheel resists the concussion; while the wheels tested under the Barr drop

are placed flange downward on a flat surface anvil block, and the wheel receives the concussion at one point only. The Chicago, Burlington & Quincy specifications require wheels tested under the Barr drop to stand 50 blows without breaking out a piece. The Pennsylvania Railroad specifications, I believe, require wheels tested to stand 12 blows under the

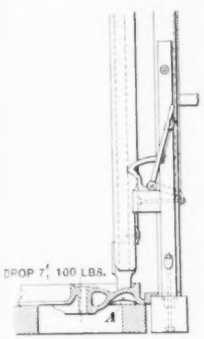


FIG. 2.—BARR DROP TESTING MACHINE.

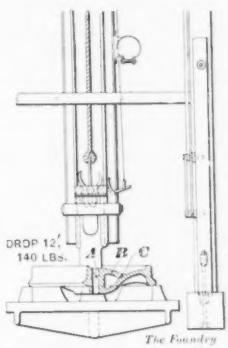


FIG. 3.—M.C.B. DROP. TESTING MACHINE.

M. C. B. drop without breaking out a piece. It would seem fair to assume that the Barr drop would find the weak or dangerous part of the wheel more readily than the M. C. B. drop.

The treatment and handling of the hot wheel has nearly as much to do with the strength as does the material used. Cold iron will produce seams in the tread, and internal strains, because the molten iron sets in the mold as fast as it is poured. Hot iron with slow and uneven pouring, produces sweat in the throat, uneven chill and internal strains; delay in getting the hot wheel into the pit after being shaken out of the mold, will also produce strains in the wheel by uneven contraction. To overcome these undesirable results it is necessary to have hot iron and fast pouring. The maximum limit of time in pouring up a 33-inch wheel should not exceed 12 seconds. Wheels must be got into the annealing pits expeditiously after being shaken out of the mold. The annealing pits should also be covered properly. The table below gives the analysis of a number of wheels tested under the Barr drop and in the thermal test.

* * *

In the discussion which followed G. R. Henderson, assistant superintendent of motive power, Chicago & Northwestern Railway said: In the paper there are given the results of some chemical analyses of wheels which have failed to stand the thermal test, others that did stand it, and the same with reference to the drop test. I wish to call attention to the fact that these are not altogether a great source of comfort. You will find that of the wheels which stood the test in both cases, the majority of the ingredients are included in the limits of those that did not stand it. In other words, it is pretty difficult to form or advance a chemical proportion of metals in the wheel which will give us just what we want. Take for instance the total amount of carbon in the wheels that failed to stand the drop test and those that did stand it. The limits of those that failed to stand it are from 3.42 to 3.87, and those that did stand it between 3.49 and 3.93. You see in that case there is quite an increase, that is, they show the total amount of graphite has been quite high in the successful wheels. Now take the wheels that failed to stand the thermal test. We will see that the variation of those that did not stand the test is from 3.63 to 3.91, and those that did stand the test from 3.38 to 3.90. I mean to say that these so overlap each other that you might find a wheel that stood the test perfectly, and another wheel that did not stand the test at all, and you practically have the same analysis.

Some years ago we went into this matter pretty thoroughly, having been asked to prepare specifications for wheel irons, and, after examining and analyzing possibly in the neighborhood of 100 wheels of which we had the

	Wheels that failed in thermal test.		Wheels that stood thermal test.		Wheels that failed under 50 blows, Barr drop.		Wheels that stood 50 blows and over, Barr drop.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Total carbon	3.91	3.63	3.90	3.38	3.87	3.42	3.95	3.49
Graphitic carbon	3.02	2.92	2.98	2.71	3.19	2.90	3.02	2.90
Combined carbon	.89	.71	.92	.67	.68	.52	.91	.59
Sulphur	.090	.042	.10	.080	.080	.020	.070	.05
Manganese	.60	.49	.58	.48	.62	.40	.72	.47
Silicon	.82	.50	.91	.50	.97	.67	1.10	.68
Phosphorus	.48	.39	.52	.26	.58	.30	.53	.28

A part of the wheels failing under these tests cannot be ascribed to the composition.

records, either from having stood or having failed to stand a certain series of tests or amounts of service, we came to the conclusion that a desirable analysis was about as follows: Total carbon, 3.25 to 3.75; graphitic carbon, 2.75 to 3.; combined carbon, .50 to .75; sulphur, .05 to .08; manganese, .30 to .50; silicon, .50 to .75; and phosphorus, .35 to .45.

Now we also found that some wheels that we analyzed having a life of from 8 to 11 years, gave the following analysis: Graphite, 2.56 to 3.10; combined carbon, .63 to 1.01; silicon, .58 to .68; manganese, .15 to .27; sulphur, .05 to .08, and phosphorus, .25 to .45. These wheels we knew had given excellent wear as they had been running eight to eleven years, and the proportions which were designated as a desirable analysis coincide very closely with these wheels that gave good service.

I think that the introduction of the thermal tests has produced this effect; the percentage of manganese has been largely increased. Before the thermal test was adopted the manufacturers did not pay so much attention to the amount of manganese, but it was found after going into the thermal test treatment that an addition of manganese, or ferro-manganese, would very largely increase the chance of standing the test. Taking the usual and ordinary iron wheel and supposed to be of a good mixture, the wheel would crack in a half second. But by the addition of a small percentage of manganese, about ¼ of 1 per cent, the wheel would stand for 15 to 20 minutes or until the ring poured around it was entirely cold, and there was no sign of fracture. When we introduced the ferro-manganese it seemed to increase the strength for the drop test also. The wheel would run up to 60, 70, or 80 plus, with the addition of a small amount of ferro-manganese. We had a small box which contained the proper quantity, about ¼ of 1 per cent, and this ferro-manganese was ground up in a big cast iron mortar, and just as the wheel was about to be poured this measure was thrown into the molten mass, stirred a little and then the wheel was poured and that seemed to be almost magical in its effect. It made the wheel stand the thermal test every time, and also the drop test. Irons that are deficient in manganese seem to be revivified by this method.

We have taken the iron from the furnace at one time, which gave us a large amount of manganese, but in a shipment at another time the manganese was less than 1 per cent, and the wheels were correspondingly brittle, but by using this ferro-manganese we were able to recuperate the mixture and get a wheel that would stand the thermal and drop tests. Whether that would affect the wear of the wheel or not is a question yet to be determined, because we have only had a year's experience with this method, therefore we cannot yet determine what the effect upon the wear of the wheel will be, but it certainly did make a wheel that was stronger, that would not crack under severe applications of the brakes.

F. A. Delano, superintendent of motive power, Chicago, Burlington & Quincy: The American engineer ought to pay a tribute to wheelmakers and to the railroads in that we have been able to make a success of the cast iron wheel in this country. That is a matter of great wonder to foreign engineers, that we dare to use a brittle metal in wheels in fast passenger and freight service, carrying the enormous loads that we do. As Mr. Beebe and others have pointed out, the wheelmakers have kept pace with the requirements, and I believe it is safe to say that the cast iron wheels of today which cost something like a cent a pound, or even less than a cent a pound, are fully equal in quality, if not better than the steel-tired wheels of ten years ago, which cost a great many times that amount. Just as Mr. Henderson has pointed out, the analyses presented by Mr. Beebe tend more than anything else to show how little analysis will tell us. The variations as pointed out by Mr. Henderson of the failed wheels are within the limits of the wheels that stood the test. But that is no reason for not continuing that kind of work, or that kind of investigation. The physical tests and the thermal tests have done a great deal to develop a wheel that will stand hard service. The wheelmakers say that the thermal test is unnecessarily severe, and I must confess that a very careful test would certainly indicate that the thermal test was a good many more times as severe as any possible test that the car wheel would receive in service with brake shoes applied. But the thermal test has done so much to bring up the quality of the wheel in respect to toughness that I believe it is a good thing.

RICHARD MOLDENKE, P. O. Box 432, New York City, secretary of the American Foundrymen's Association, is asking the foundrymen of the country to advance what information they possess relative to the loss of iron in melting with the cupola. Special question blanks will be furnished upon request.

MIXING IRON BY ANALYSIS.

BY W. G. SCOTT.

Calculating the Cupola Mixture.

In the February issue of THE FOUNDRY our readers were promised a description of the mixing card used in making up the cupola mixture; this card shows the number of pounds of coke, flux, scrap and pig iron in each charge.

No description is needed, as the card on next page shows every ingredient used and gives the estimates, blast, etc.

Before making out the mixing card we should know exactly what grade of castings are wanted, and should decide upon the brands or kinds of pig iron to be used in the mixture.

For illustration we will say that we have the following pig irons on hand, and that the chemical analysis is as follows:

The last mentioned is Bessemer steel rail cut to lengths of 18 and 24 inches; we use a small quantity of rail for reducing the graphitic carbon in certain mixtures.

Pile Number.	Grade.	Silicon.	Sulphur.	Phosphorus.	Manganese.	Carbon.	Graphite.
450	Foundry No. 1	2.90	.022	.680	.42	.21	3.20
741	" " 2.....	2.15	.031	.700	.45	.39	3.10
650	" " 3.....	1.80	.045	.695	.56	.42	3.30
375	" " 4.....	1.00	.055	.702	.63	.55	2.98
907	Silver Gray No. 1.....	4.25	.048	.780	.40	.10	3.88
901	Ferro-Silicon.....	8.50	.022	.554	.46	.20	2.10
362	Manganese Pig.....	3.40	.025	.333	1.88	.35	3.25
965	Phosphoric Pig..	2.50	.061	1.162	.46	.46	2.90
400	Charcoal No. 3	.75	.015	.171	.52	.80	2.99
202	Malleable Bessemer.	1.40	.031	.185	.77	.54	3.09
98	Steel Rail.....	.05	.052	.082	.72	.35	.....

The leading "carbon" refers to combined carbon, "graphite" to graphitic carbon.

Very few foundries have such a varied assortment of irons, in fact they are not needed unless the concern is making gray iron, malleable, and steel castings.

The writer has selected these irons from his records for the purpose of future description and reference to other than gray iron mixtures.

For the present we will take up gray iron only, and describe the mixtures for three different grades of cast iron.

We will assume that the analysis of the average "home scrap" is 2.00 per cent silicon and 0.082 per cent sulphur; and that of "foreign scrap" the same in silicon but higher in sulphur: for safety we estimate it at 0.100 per cent.

The two elements or metalloids usually considered in gray iron mixtures are silicon and sulphur; in malleables the silicon, sulphur and manganese are given consideration, taking it for granted of course, that phosphorus is within specified limits; in steel castings all of the metalloids are to be figured and kept within bounds.

In making our mix for gray iron we will at first consider the silicon only, thereby reducing the process to one calculation.

It must not be taken for granted that silicon and sulphur is the "whole thing" in gray iron mixtures, but for ordinary practical work these two metalloids are the controlling elements.

Returning to our subject, we will say that we have decided upon the three following grades of gray iron castings:

Grade No. 1 for steam cylinders, in which the silicon is to be estimated at 1.70 per cent.

Grade No. 2 for medium heavy work, with the silicon figured at 2.00 per cent.

Grade No. 3 for light thin castings with 2.50 per cent of silicon.

GRADE NO. 1—In this grade the silicon is estimated at 1.70 per cent; furthermore, we wish to make a three pig mix and use 45.00 per cent of home scrap and 5.00 per cent of steel rail. How are we going to figure out the exact per cent or number of pounds of each so that the resultant product will contain 1.70 per cent of silicon?

In answer to the above question it may be stated that the process is performed by means of a method called *alligation alternate*

Very few people understand this method, and, as the rules for such in the arithmetics are more confusing than otherwise, the average business man generally lays the book aside in disgust.

We shall not follow any given rule in our description of the method, but shall try to explain it by means of examples and hope that all points may be made so plain that any one can calculate a mix by this method.

As previously stated, our estimate in this case is to be 1.70 per cent of silicon, but as there is always a loss of silicon, due to oxidation, combustion, etc., in the cupola, we have to allow for such loss.

DAILY REPORT OF MELTING—J. I. Case T. M. Company Foundry. Feb. 21 1901

Charge	Wood	Coal	Coke	Flux		Home Scrap Hard	Home Scrap Soft	Foreign Scrap	Steel Scrap	Pig No. 375	Pig No. 650	Pig No. 362	Pig No. 741	Pig No. 457	Pig No. 917	Pig No. 765	Pig No.	Pig No.	Pig No.	Total Melt.
						Si.	Si. 2.00	Si. 2.00	Si. .65	Si. 1.00	Si. 1.80	Si. .840	Si. 2.15	Si. 2.90	Si. 4.26	Si. 2.50	Si.	Si.	Si.	
			.41		S.	S.	S. .082	S. .100	S. .052	S. .055	S. .045	S. .025	S. .031	S. .032	S. .048	S. .061	S.	S.	S.	
Bed	½ cd		1800																	
1			400				1350	1350	300	1053	1054	893					Pd.1	Scrn.		6000
2			450				900	900	200	703	702	595								4000
3			450				900	900	200	703	702	595								4000
4			425				1200	1200			875		200	175	350					4000
5			400				1200	1200			875		200	175	350					4000
6			375	100			1050	1050			766		175	153	306					3500
7			375	100			1050	1050			766		175	153	306		Pd.2	Scrn.		3500
8			350	100			1050	1050			766		175	153	306					3500
9			350	100			1050	1050			766		175	153	306					3500
10			350	100			1050	1050			766		175	153	306					3500
11			350	100			787	787			295	295		295	746	295				3500
12			325	100			787	787			295	295		295	746	295				3500
13			325	100			787	787			295	295		295	746	295				3500
14			325	100			787	787			295	295		295	746	295				3500
15			300	100			787	787			295	295		295	746	295				3500
16			300	100			787	787			295	295		295	746	295	Pd.3	Scrn.		3500
17			300	100			787	787			295	295		295	746	295				3500
18			300	100			787	787			295	295		295	746	295				3500
19			300	100			787	787			295	295		295	746	295				3500
20			300	100			787	787			295	295		295	746	295				3500
21			300	100			787	787			295	295		295	746	295				3500
22			100				450	450			169	169		169	424	169				2000
23																				
24																				
25																				
26																				
27																				
28																				
29																				
30																				
31																				
32																				
33																				
	½ cd		12250	1600			19907	19907	700	2459	11462	5497	1275	4529	10860	3414				80000

Ratio of Fuel to Iron 8.65

Blast on 2.30 P.M.

Bottom Dropped 5.55

Estimated Analysis: No. 1 Iron Si. 1.70 S. .085; No. 2 Iron Si. 2.00 S. .091; No. 3 Iron Si. 2.50 S. .184

Remarks: Blast— 12.15 m. " 13.25 " " 14.00 "

This loss has been proven by practical experiment to be from 0.15 to 0.25 per cent.

In a 60-inch cupola the average loss is about 0.20 per cent, therefore allowing for this we must raise our estimate to 1.90 per cent.

Now if each part contains 1.90 per cent of silicon, it is obvious that one hundred parts or 100.00 per cent of the mixture will contain 190.00 per cent of silicon.

Forty-five parts of home scrap and five parts of steel rail give the following total silicon per cent, thus:

Parts.		Silicon.		Total Silicon.
45.	x	2.00	=	90.00 per cent.
5.	x	.05	=	.25 " "
50.				90.25

Now, if one hundred parts of the mixture is estimated to carry a total of 190.00 per cent of silicon, and a *given quantity*, (i. e.—fifty parts) carries a total of 90.25 per cent then the remainder of the mixture (50 parts) must carry the difference or 99.75 per cent.

This 99.75 per cent of total silicon represents the pig part of the mix, and our *silicon estimate* for the pig iron is obtained by dividing 99.75 per cent by 50 parts.

99.75 ÷ 50. = 1.995 per cent.

Therefore, having determined the *estimate* for the pig iron part we may now proceed by alligation and find the required quantity of pig to be used.

The method of alligation is based on the fact that if we sell a ton of iron costing $15.00 for $12.00, thereby losing three dollars, we must sell another ton of the iron for $18.00 in order to come out even in the transaction.

On the same basis, if our silicon estimate is 1.995 per cent, we must use irons which are *lower* and *higher* in silicon than the estimate.

The three pig irons we have selected for our cylinder mix are as follows:

Pile Number.	Grade	Silicon Content.
375	Foundry No. 4.	1.00 per cent.
650	" " 3.	1.80 " "
362	Manganese Pig.	3.40 " "

Any other irons could be used providing part were lower and part of them higher in silicon than the estimate.

Now for the alligation method; first lay out the *plan* as here shown.

Estimate.	Pig Iron Silicons.	Differences.	Balances.	Total Balance.
	1.00			
	1.80			
1.995				
	3.40			

Alligation Plan (Fig. 1).

It will be noticed that the deficient or lower silicons are placed above the horizontal dotted line and that the excess or higher silicon is placed below.

Subtract each silicon in the pig iron column from the estimate and set down the result in the difference column (we write down the differences in red ink) opposite or to the right of the given pig iron silicon.

The deficiency for the 1.00 per cent pig is 0.995; for the 1.80 per cent pig it is 0.195 and the excess for the 3.40 per cent pig is 1.405.

The alligation may now be balanced by placing a deficient quantity below the horizontal dotted line and transposing the corresponding excess; that is, if we set a deficiency below the line and opposite an excess we must place this particular excess above the line and opposite the deficiency just taken.

Estimate.	Pig Iron Silicons.	Differences.	Balances.		Total Balance.
	1.00	.995	1.405		1.405
	1.80	.195		1.405	1.405
1.995					
	3.40	1.405	.995	.195	1.190
					4.000 parts.

Alligation Plan (Fig. 2).

The first balance was made by placing .995 below the line and opposite of 1.405 then transposing 1.405 to its place above the line and opposite of .995, thus satisfying these two quantities.

The next balance is made by placing .195 below the line and opposite of 1.405 and then transposing 1.405 opposite of .195.

In this case we get two numbers for the quantity below the line, this however, is quite proper and they are added together and the result set down in the total balance column.

Adding up the total balance we get 4. parts which represent 50. parts or 50.00 per cent of the pig iron mix.

If 4. parts *represent* 50. then one part will be equivalent to 12.50 which is the *factor* used to convert the quantities in the total balance column into the proper percentages or parts, thus:

Factor.		Parts, Total Balance.		Per Cent of Pig Iron to be Used.
12.50	x	1.405	=	17.5625
12.50	x	1.405	=	17.5625
12.50	x	1.190	=	14.8750
				50.0000

There is no question but what the above is a long explanation for a short process, yet it is the only way in which it can be expressed.

In proof that the foregoing figures are correct, the following statement may be consulted.

Grade.	Silicon Content.		Per Cent to be Used.		
Home Scrap.....	2.00	x	45.0000	=	90.0000
Steel Rail.....	.05	x	5.0000	=	.2500
Foundry No. 4....	1.00	x	17.5625	=	17.5625
" " 3....	1.80	x	14.8750	=	31.6125
Manganese Pig..	3.40	x	14.8750	=	50.5750
			100.		190.

If 100. parts of the mixture be equivalent to 190. per cent of silicon, each and every part will represent 1.90 per cent.

Subtracting the loss 0.20 *from this we have* 1.70 *per cent for the silicon in our castings...*

In practical work it is not customary to carry out the figures to more than two decimal places, the slight variation in the final result being too small for consideration.

GRADE NO. 2—This grade of cast iron is to be a four pig mix and carry 60.00 per cent of scrap.

The silicon in the castings to be 2.00 per cent; therefore, including loss by oxidation, etc., this figure is changed to 2.20 per cent as a corrected estimate.

One hundred parts of the mixture will of course represent a total silicon content of 220. per cent.

Sixty parts of scrap with 2.00 per cent silicon will likewise give a total silicon content of 120. per cent.

Subtracting, we have 100. as the total content for the remaining 40. parts of pig, or 2.50 per cent of silicon per part, hence 2.50 is the estimate to be used in the alligation.

The pile number, silicon, etc., being given and the plan (Fig. 3) illustrated it is quite unnecessary to repeat the explanation.

Estimate.	Pile No.	Silicon Content.	Differences.	Balances.		Total Balance.
	650	1.80	.70	1.75		= 1.75
	741	2.15	.35		.40	= .40
2.50						
	450	2.90	.40		.35	= .35
	907	4.25	1.75	.70		= .70
						3.20 parts

Alligation Plan (Fig. 3).

Forty parts of pig iron, divided by 3.20 gives 12.50 as a factor for converting the alligation parts into the desired mixture parts.

12.50	x	1.75	=	21.875
12.50	x	.40	=	5.000
12.50	x	.35	=	4.375
12.50	x	.70	=	8.750
				40.000

In proof of which we have the following:

Grade.	Silicon Content.		Per cent. to be used.		
Scrap.....	2.00	x	60.000	=	120.0000
Foundry No. 3,	1.80	x	21.875	=	39.3750
" No. 2,	2.15	x	5.000	=	10.7500
" No. 1,	2.90	x	4.375	=	12.6875
Silver Gray.....	4.25	x	8.750	=	37.1875
			100.000		220.0000
			1.	=	2.20 per cent.
Subtracting "loss"..... ...					.20
Silicon in Castings.....				=	2.00 per cent.

GRADE NO. 3.—In this case we desire a soft iron with a silicon content of 2.50 per cent.

From the examples given it may be seen that it is an easy matter to make a number of changes and vary the mix in several ways, using the same pig irons.

The previous examples were in relation to a three pig and a four pig mix; in the third grade a five pig mix will be explained, and peculiar conditions introduced in order to illustrate the different ways of applying the alligation method.

The castings are to have a silicon content of 2.50 per cent; five different pig irons are to be used, and the mixture is to carry 45.00 per cent of scrap.

The pig irons in question are as follows:

Pile No. 650 with 1.80 per cent of silicon.
" 965 " 2.50 " "
" 450 " 2.90 " "
" 362 " 3.40 " "
" 907 " 4.25 " "

In addition to all of the above requirements, *we want to use equal parts of the first four pig irons.*

Our estimate with loss included will be 2.70 per cent, or 270. per cent of total silicon in 100. parts.

Forty-five parts of scrap with 2.00 per cent of silicon is equivalent to 90.00 per cent of total silicon.

Subtracting 90. from 270. we have a total of 180. for the remaining 55. parts of pig iron, and dividing 180. by 55. we get 3.27 per cent for the estimate of one part.

The *average* per cent of silicon in the first four pig irons is 2.65.

Therefore with an estimate of 3.27, an average of four irons with 2.65 and one iron with 4.25 per cent of silicon, the balance may be taken from the following alligation:

Estimate.	Silicon.	Difference.		Balance.	Total Balance.
	2.65	.62	.98		= .98
3.27					
	4.25	.98	.62		= .62
					1.60 parts.

Alligation Plan (Fig. 4).

55. ÷ 1.60 = 34.38 Factor.

Factor	34.38	x .98	=	33.68
"	34.38	x .62	=	21.32
				55.00

Equal parts of the *four* specified pigs are wanted; hence, 33.68 divided by 4. gives 8.42 parts or per cent, which is the amount of each to be taken.

The proof is as follows:

Pile Number.	Silicon Content.		Per Cent of Pig to be used.		
650	1.80	x	8.42	=	15.16
965	2.50	x	8.42	=	21.05
450	2.90	x	8.42	=	24.42
362	3.40	x	8.42	=	28.63
907	4.25	x	21.32	=	90.61
Scrap	2.00	x	45.00	=	90.00
			100.00	=	269.87
			1.		2.70

Subtracting loss, gives 2.50 per cent of silicon in the castings.

In the last example decimals were not carried out in full, therefore the slight deficiency.

In practical work where time is valuable, there is no use of being so particular; furthermore, after the first mix is made by alligation it is not necessary to use the method for slight alterations as experience will soon enable one to adjust the difference by trial, or at least strike the estimate near enough for all purposes.

The various examples are given to show the modifications of the alligation method, but in practice it seldom occurs that more than one will be used.

After the percentages have been figured, it is an easy matter to reduce the desired result to pounds.

For example, take the first charge on the mixing card where a total of 6,600 lbs. is required; multiply 6,000 by the given per cent, and place the result under the proper heading.

It will be noticed by inspection of the mixing card that the melter uses half "home" and half "foreign" scrap, consequently in a total of 45.00 per cent "scrap" there will be 22.50 per cent of home and the same per cent of foreign scrap, therefore the reduction to pounds will be as follows; remembering that whole numbers multiplied by per cent on a basis of 100. will give the amount of 100. parts instead of one part. Chemists and certain other professional men point off the decimal place in percentage different from the commercial man, thus: A chemist in writing down twelve and a half per cent expresses it as 12.50.

The commercial man writes it down with the decimal point removed two places to the left, as .125.

If the first system be used the reduction of the 6,000. to pounds would be misleading unless it were remembered to divide the result by 100.

On the other hand there is no division and the pointing off of decimals is very simple.

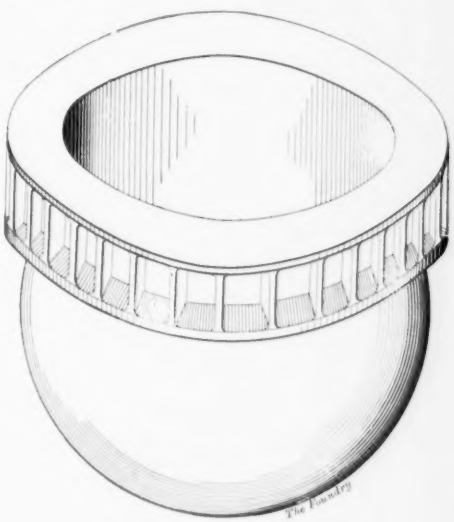
For convenience we will use the second method, in figuring the first charge.

Total Melt, lbs.		Per Cent. to be used.	Grade or Brand of Iron.		
6000	x	.225	Home Scrap,	=	1350. lbs.
6000	x	.225	Foreign "	=	1350. "
6000	x	.05	Steel "	=	300. "
6000	x	.1756	Pile No. 375,	=	1053. "
6000	x	.1756	" 650,	=	1054. "
6000	x	.1488	" 362,	=	893. "
		1.0000			6000.

The other charges are figured in precisely the same manner.

A Pan of Unusual Shape.

In molding the pan shown in the illustration by the method to be described very little extra time and labor need be expended than is necessary in the molding of an ordinary shaped pan. By an ordinary pan I mean one in which the core may be lowered with the cope, or the cope closed over the core. As will



A PAN OF UNUSUAL SHAPE.

be seen, however, by the illustration, the diameter of the core in the center is much greater than at the top, or flange, making it impossible to close the mold in the ordinary way.

In the section Fig. 1 will be seen the arrangement of building rings and bolts used in securing the core, etc., and as twelve castings were required it was decided to use prodded rings to bind the cope brickwork and also to save ramming up the mold and to preserve as much as possible of the building when withdrawing the casting from the mold.

The bottom part is first bricked up in the usual way, the strickle having a guide round the outside of the bearing 1½ inches deep.

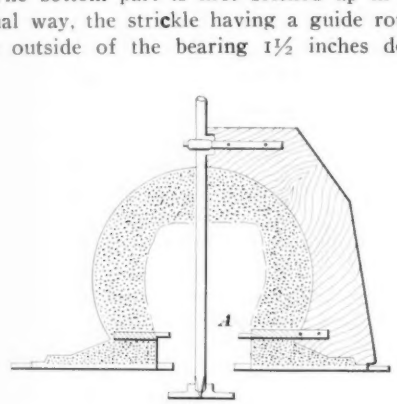


Fig. 2

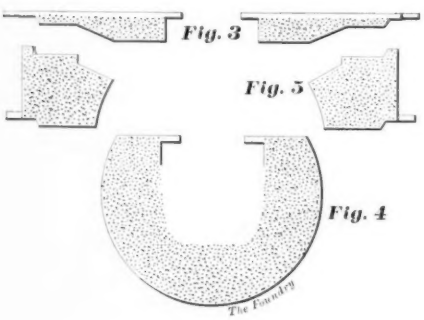


Fig. 3

Fig. 5

Fig. 4

The middle part or cheek is then made on a separate plate, with a reverse guide to match the lower part on its bottom face, and also a guide round the outside of bearing.

The core is built on the covering ring as shown in Fig. 2. The plate is first swept as high as the finger A, which is then taken off and the joint dried, a ring is bedded onto the joint having eight lugs cast on its inside, four to match similar lugs on the covering ring, and the other four to match the staples cast in the crown iron; the core is next bricked and a building ring bedded on about the center of the building, and continued until high enough for the crown iron. After finishing off the core and before drying, four hook bolts are placed in their positions. Four bolts are also fixed into lugs cast in covering ring and the joint ring, none of these bolts are made tight until the core is dry.

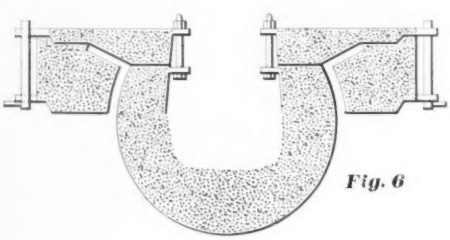


Fig. 6

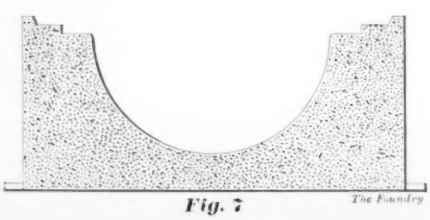


Fig. 7

The various parts of the mold being ready for closing all bolts are tightened up, the covering ring with core attached is now rolled over on a bed of loose sand and set level, the crown resting on the bed of sand. The four bolts holding the covering ring and joint ring together are removed, a few guide marks cut into the joint edges, and covering ring lifted off the core and set onto the middle part. Figs. 3 and 5 show covering ring and middle part respectively. These two parts are clamped together and lifted and set onto the core Fig. 4. The four bolts are next replaced and the three parts consisting of covering ring, middle part and the core are set into the guide in the bottom cope as in Figs. 6 and 7. The mold is gated with a number of flat gates through the covering ring. The weight of the casting is about 9,000 lbs.

GEORGE BUCHANAN.

Shipment of Connellsville Coke in 1900.

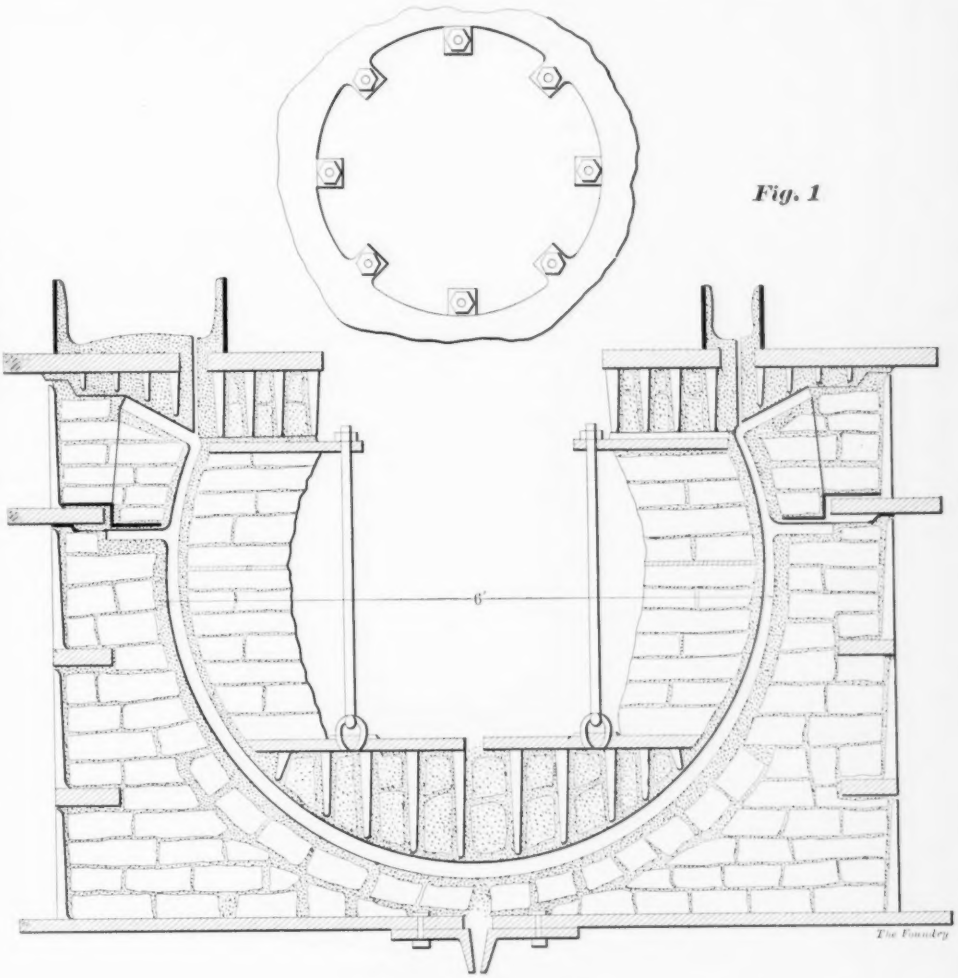
During the year 1900 the Connellsville coke region shipped 10,166,234 net tons of coke, for which the operators received an estimated average price of $2.70, making the value of the product at the ovens reach the enormous aggregate of $27,448,832. This is one-third more than the amount estimated to have been received for the product of 1899, though in volume it was practically the same, the output that year being 10,129,764 tons. The value of the coke output of 1900 is double the value of that of 1898, or of any other year in the history of the Connellsville region.

The price of furnace coke ranged all the way from $2.50 to $4, and foundry coke from $2.50 to $4.25. Four-dollar coke has hitherto been a rare thing in the Connellsville region, and it never lasted very long at a time, being the result of desperate conditions that of necessity were soon terminated. Last year, however, the price was made deliberately. The furnacemen

had in 1899 enjoyed the benefit of $2 coke for making $24 pig iron, and they were at the high tide of prices and prosperity at the opening of 1900. The coke operators demanded a commensurate price for coke and the demand was acceded to. When subsequently the bottom dropped out of the iron boom coke prices came down accordingly.

A glance at the record of the past twenty years shows how wonderfully the coke trade of the Connellsville region has grown in spite of the very many and very extensive coking fields opened in other sections. In 1880 the output was only 2,205,000 tons. It rose gradually in the next decade until in 1890, a boom year in iron, it reached the then enormous total of 6,464,000 tons. Two years of depression followed in which the output ranged from four to five million tons. In 1895 came another boom that sent production up to the theretofore undreamed of figure of 8,244,000 tons. The very next year, however, it dropped to 5,411,000 tons, but quickly recovered and in 1898 showed a total of 8,460,000 tons, a greater output than that of 1895. This was, however, only a starter. The output of 1899, and that of the past year, as noted above, exceeded 10,000,000 tons each year.

Fig. 1



A PAN OF UNUSUAL SHAPE.

The total number of ovens in the region increased during the year from 19,689 to 20,954. New ovens to the number of 1,343 were built, while 78 ovens at the Tyrone works of Laughlin & Co. were abandoned, making a net gain of 1,265 ovens.

With the increased output of the region and the growing demand for cars in which to carry it there has been a steady increase in the capacity of the cars. The coke cars of ten years ago averaged from 15 to 17 tons capacity. The average to-day is from 20 to 21 tons. Coke cars vary very greatly in size, their capacity running all the way from 15 to 30 tons.

If there was little done in the way of construction in the Connellsville region proper last year the coke men in the new Masontown district, in the southern end of Fayette county fully made up for it. They put in a busy twelve months preparing to make coke on an extensive scale. The present year is expected to see 3,000 completed ovens in the Masontown district.—[Connellsville Courier.

Balancing Car Wheels.

In the course of a discussion at the December meeting of the Central Railway Club, Mr. Pemberton Smith called attention to the following concerning car wheels:

Reference has been made to the fact that on certain roads in Europe car wheels were balanced, and that it was thought in America we had not gotten so far in a consideration of proper mechanical conditions of wheels. It will doubtless be of interest to know, therefore, that this balancing of car wheels has been the practice of a New York car wheel works for wheels furnished for passenger and locomotive service for the past ten years. All of you who have foundries connected with your shops will appreciate the difficulty in making a casting weighing a quarter of a ton that shall be exactly symmetrical in balance. After many trials of different devices and methods of balancing wheels, the following was adopted: In the manufacture of each wheel small lugs are cast upon the plate, preferably between the brackets or arms on the flange side, each lug having a ¾-in. tapered hole formed by a core. The wheel is first bored and "machined," i. e., ground on the tread by means of emery wheels to make it truly round, and an expanding mandrel with projecting ends is then inserted in the bore and the wheel is rolled along parallel ways, being supported by the projecting ends of the mandrel bearing upon them. The force of gravity naturally makes the heavy part take the lowest position, and the wheel is then turned 90 degrees, so that this heavy spot is on the horizontal diameter, and by means of a lever arm with sliding weights the exact amount that the wheel is out of balance is accurately determined. If this amount is found to be over 2 lbs. for a wheel weighing 600 lbs. the wheel is balanced as follows: Balancing blocks of different weights, which are indicated by figures cast upon them, are made of suitable shape to fit between the brackets of the wheel, and they are provided with a recess to fit over the lug and cored hole on the wheel above referred to, through which a rivet may be passed. A ¾-in. rivet, with one end at white heat, is then passed through the block and enters the tapered recess of the lug on the wheel at a point directly opposite the heavy spot. The rivet is driven home, the heated end upsets, and the balancing block is securely fastened in place. When the blocks are placed between the brackets or arms, they are not only out of the way, but can be firmly secured and held in position, the brackets on each side tending to prevent any lateral motion, and the rivet preventing any vertical motion, and of the number of scrap wheels that I have personally examined, that have been from two to five years in service, the balancing block has always been found in place, and as tight as when the wheel was first shipped. It will be noted that the important feature of this method of securing the balancing blocks is that nothing is done to impair the strength of the wheel in attaching them, no holes being bored through the plate from which cracks may start when severe strains are put on the wheels in service. I have referred to the fact that this balancing of wheels was only done for wheels intended for passenger and locomotive service. A reason for this is that railroad companies are willing to pay more for this class of wheel, but there is nothing to prevent its being applied to all freight car wheels, with the increased loads and speeds of freight trains and the necessity of moving a maximum number of cars with every engine; the question of balancing wheels under freight cars is one that will in time receive due consideration. A rather interesting indirect result of the introduction of balancing in the foundry mentioned was that certain patterns and chills were found to produce wheels that were more out of balance than others, and this was immediately corrected, the result being that the whole foundry practice was improved.

Maine Notes.

The Saco & Pettee Machine Co. are going to build a new foundry at Biddeford, Me.

T. A. Johnstone has taken charge of the Portland Co.'s foundry, Portland, Me.

CAST IRON NOTES.

Devoted to inquiries from Practical Foundrymen on the subject of Melting and Using Cast Iron. Address all inquiries to W. J. KEEP, care of The Foundry.

WHY DOES A PIECE OF SOLID CAST IRON, THROWN INTO A LADLE OF FLUID IRON, FLOAT WHILE IT MELTS?

This peculiar occurrence has been explained by the supposition that the solid piece was enveloped by a film of moisture which held it up. Another explanation was that the solid piece does not become wetted by the fluid metal. Neither of these explanations is correct, because the solid piece always floats, however much pain is taken to keep it under the surface until it is all melted.

The higher the percentage of silicon in the solid iron the higher it lies, and if the iron is white it may lie almost or entirely under the surface.

In 1895 I discovered the reason for this action of iron. In the spring I had constructed a machine which made an autographic record of the behavior of cast iron in a test bar while cooling from a fluid to a solid state and until it was cold. It was shown to the American Society of Mechanical Engineers at the Detroit meeting in June, and for the first time gave the reason for solid iron floating as it melted on the surface of fluid cast iron.

This machine showed that a 1 inch square test bar, as soon as a rigid shell was formed, constantly decreased in size, on account of the loss of heat, until it was perfectly cold. This was the process of shrinkage known to all founders.

If this was all that occurred a piece of cold cast iron thrown on the surface of fluid iron would at once sink to the bottom and would slowly rise and reach the surface just as the last was melted.

The machine showed, however, that just after the test bar was all solid, and while still at a red heat, it suddenly became more expanded than when it was fluid, and then gradually shrunk until cold. I heated a test bar nearly to the melting point and found that just before hot enough to melt the test bar became suddenly larger, and then smaller, and then it melted. High silicon irons increased and decreased in bulk three different times before melting.

Bearing these things in mind, when a piece of cast iron is thrown into a bath of melted cast iron it sinks out of sight.

If it is iron containing more than one per cent of silicon in a few seconds it will rise to the surface. It may settle and then rise twice, but will finally rest with its upper surface considerably above the fluid surface and the under surface of the piece will melt.

At the instant when the metal is most bulky its whole crystalline structure changes, and the graphite combines with the iron and then the bulk decreases and the iron melts.

White iron having its carbon all combined will not expand more than molten metal and will melt under the surface.

Melting is separating the atoms of a material from each other by means of heat.

A TEST OF HARDNESS—IS CASTING A TEST BAR AGAINST A CHILL AND MEASURING THE DEPTH OF CHILL A SATISFACTORY HARDNESS TEST FOR UNCHILLED CYLINDER IRON?

Chill does not seem to be dependent on chemical analysis, and why one iron when run against an iron surface will become white and another not, has yet to be explained. The general rule is, that the lower the silicon the deeper will an iron chill, but some iron with considerable silicon will take a deep chill.

When the carbon in a chilled surface is nearly all combined, in the gray part of the casting it may be nearly all graphite, and immediately back of the chilled portion there will be more graphite than farther back. A chilling iron may make unchilled castings entirely free from combined carbon. Chilling iron should not be used for cylinders because some influence of the mold may cause hard spots to form.

With unchilling irons the silicon may be as low as necessary to produce a close grain, and this low silicon will cause more or less of the carbon to be combined, but the iron need not take a true chill.

An increase of manganese will harden cylinder iron, but by decreasing silicon the wearing surface will be hard enough without manganese.

Other things being equal increasing combined carbon increases hardness. A chill test will not show whether the nonchilled parts are hard.

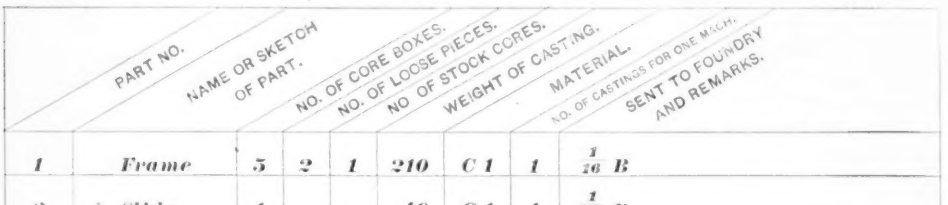
Marking and Numbering Patterns.

JOHN M. RICHARDSON.

As soon as a concern owns more patterns than it can instantly identify at sight, and tell which they are and where they belong, then some system of classification becomes impera-

tive, and this should be at the outset, for, provided the number of patterns were so few that the parts could be located mentally, it would be awkward and difficult to order castings from the foundry by a description of the piece required.

This at once brings us to some method of identification, either by figures or letters, or a combination of both. The requirements of some shops are such that different systems of numbering are best adapted in special instances, but for a shop where a variety of machines are made in various sizes and styles, the system I am about to describe, while having no original features to lay claim to, still seems admirably suited for its simplicity.



PART NO.	NAME OR SKETCH OF PART.	NO. OF CORE BOXES.	NO. OF LOOSE PIECES.	NO. OF STOCK CORES.	WEIGHT OF CASTING.	MATERIAL.	NO. OF CASTINGS FOR ONE MACH.	SENT TO FOUNDRY AND REMARKS.
1	Frame	5	2	1	210	C I	1	$\frac{1}{16}$ B
2	Slide	1			40	C I	1	$\frac{1}{19}$ B
3	Leg	1			20	C I	4	$\frac{1}{20}$ B

MARKING AND NUMBERING PATTERNS.

In this method, letters are dispensed with, entirely for numbering purposes, and figures used only, each machine having a number of its own which remains constant, and each pattern used on that particular machine, being numbered consecutively from one upwards, the first number being the class number, and the second the part number. It is better to omit every tenth class number commencing with 20, for supposing pattern number 20-5 is called for, it sounds in speaking too much like twenty five, which would be a single number, and there are none of these in this method.

In the figure is shown one page of a blank book ruled to keep track of the patterns, and it is almost self explanatory. The common fraction at the right of the page indicates the date, the numerator the month, and the denominator the day of the month, and the annexed letter stands for the foundry where sent. In many shops they circulate the various patterns around in different foundries where they have none of their own, and the first item in the book reads "Sent to Blank's foundry Jan. 16." When a pattern is returned, simply draw a line through the fraction diagonally, and this indicates that it is at home. When it is sent off again repeat the fraction and letter to suit date, and so on, until it becomes necessary to erase the dates, and start out again afresh.

C. I. stands for cast iron in the material column, Ph. B. phosphor bronze, B. brass, M. I. malleable iron, etc.

A book of this kind, indexed on the right hand edge of the pages with the class numbers, in the same way books are often indexed with

letters, makes it possible to turn to any class instantly. One can hardly appreciate the advantages unless they have tried it, and it can be easily done in a short time, with a sharp knife or a pair of scissors and a pen. Two or three leaves should be allowed for each number, to give room enough for the consecutive numbering of all the patterns coming under any one head.

Knowing the number of any pattern, one can at once find its name, and the machine to which it belongs, by referring to this book, but when one wishes to know the class number of any given machine and remembers the name of machine only, it is convenient to have a little book or catalogue at hand, indexed alphabetically with the names of all machines built, and immediately after these, have the class number set down in plain figures. This last book can be quite small, a pocket size doing as well as anything.

It is very important to have all patterns plainly numbered, and to have these show on the casting, as this makes the piece easy of identification, and the man who handles the casting can place it in the rack where it belongs without any questions, and it is identified by its number all through the various departments of the shop as well. Raised figures should be used for this purpose, and for small and medium patterns, the style of figure known as "hair line" works admirably. For the dashes which separate the class from the part numbers buy the letter H of the same size and style, and cut away the bar with a knife point. These letters will cost no more than the figure I and it makes two dashes. In addition to the raised figures, all patterns should be stamped plainly with a steel stamp having the firm or company name on it, or at least the initials, and also the class and part number stamped on with individual figures. This acts as a safeguard in case the raised figures come off, as they sometimes do, even when carefully put on as they usually are, with thick gummy shellac, the shellac being applied to the back of the figure, which is then pressed firmly in the proper place on the pattern.

If the pattern thus marked is too heavy to be easily handled, it is well to paint on the number in quite bold figures, also. This will often save needless moving when hunting for any given piece if they are closely packed away. Sometimes a mixture of white lead is used for this purpose where the patterns are varnished black, and sometimes vermillion mixed with shellac. This latter I prefer, and it does equally well for the purpose, whether the pattern is varnished light or dark.

There is one more form of marking which might be mentioned in this connection and that is indicating how many castings are required at any given time from any pattern. The simplest and at the same time it seems to me the worst way is to take a piece of chalk and just mark a figure corresponding to the number of castings wanted. Now the trouble with this method is that if the patterns are handled much or have far to go before reaching the foundry, this chalk mark gets rubbed off, or at least, so obliterated that it is nearly impossible to decipher.

Pasting on labels, or stickers having the number on them, is, to my mind, another bad way also, for, on light castings, these small square or rectangular pieces of paper show out in bold relief when cast, and it is decidedly unsightly to see a little casting with a "patch" on it in some conspicuous place. It is much the wisest plan to have a written order accompany each lot of patterns to the foundry. This can be filled out in duplicate on a printed form by using carbon paper between, and the original accompany the pattern, and the copy be retained, this to be used in checking off the castings as they arrive. In some cases it may be a number of days before they are all in. By this method all chalking is done away with before getting to the foundry, and if done there, the sender will not be responsible.

In some foundries the patterns are turned over to the molders with the number of castings required marked with chalk, and in others a printed tag goes with each pattern with the number wanted, and blanks to be filled out with molder's name, etc. This seems to be a very sure way for the foundry to keep the patterns and castings straight.

Bench Molding.

P. LONGMUIR.

Small castings are generally molded in benches, tubs or troughs. The advantages of tub over bench or "vice versa" are often matters of training or environment. The sketch (fig. 1) shows a good handy bench. At the back is a shelf for holding tools, parting-sand box and patterns. The tub is perhaps more familiar in brass foundry practice than in gray iron founding. A suitable one is shown in Fig. 2. Movable skids about 2 inches by 3 inches rest on ledges and on these the flask is worked. The tub shown is arranged to work

two men and it will hold a supply of sand to fill a number of flasks. An advantage of the tub is that good lifts can be obtained from straight patterns. As the cope is being lifted the side of the tub can be rapped and by this means good lifts are generally assured.

So much for the benches or tubs themselves; the next consideration is their arrangement both as regards making up the molds, and putting them down to cast. It follows that this arrangement will vary with different classes of work and must be such as will expedite the

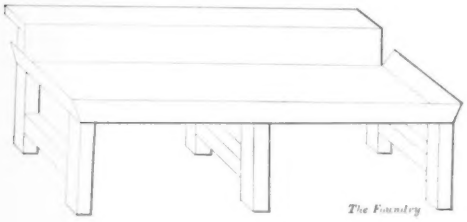


Fig. 1

molding and casting. Good space must be found to put down the flasks, this matter (a fairly easy one in the brass foundry where heats are taken off several times a day) becomes more difficult when iron foundries casting once a day have to be provided for. In this case large floor spaces are required and the boxes made up towards the end of the day have to be carried a considerable distance. It often pays to have a tier arrangement so

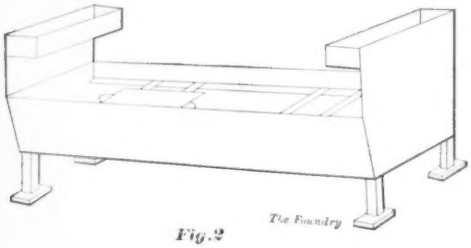


Fig. 2

that each man can put down his flasks one upon another—thus economizing space and saving much carrying of flasks and metal. Another idea is to have running out from each fixed bench a set of narrow gauge rails well supplied with small trucks each capable of holding three or four flasks. These trucks are run out to the casting floor, from thence to the sand mixing shop and returned to the molder with flasks and sand ready for use again. With some classes of work movable benches are a success, that is a bench to travel with the work. This is of course a small light bench and it is worked the length of the sand heap in a day, working back the opposite direction the following day.

Bench molders, as with floor molders, should be well supplied with tools. These tools should be of real use to the work they are engaged on, whether it be snap, box, plate or odd-side molding. No man should have occasion to leave his bench and look round the shop for tools and although such a thing is pretty familiar in many foundries, it is, to say least of it, not a sign of good management. A good stock of standard boxes, with bottom boards, weights and runner cups to suit should be always on hand. There should be no excuse for hunting up boxes.

The tools supplied to each man include shovel, ¼-inch riddle, ⅛-inch sieve, rammers, strickle, bellows, dry and wet brushes, blackening or meal bag and small water pail. Runner pegs and gates are supplied to suit the class of work. Each man should be held responsible for the proper use and care of his own tools. Several firms ensure this by deducting a certain sum from each man's wages when the tools are delivered over to him. This amount is kept on hand and paid back when a man leaves—minus the sum required to pay for careless handling. The molder's own kit of tools is expected to include all that he is likely to require for the class of work on which he is engaged.

Chilled Wheels for Heavy Service.

In our March issue we reprinted an article from the *American Engineer and Railroad Journal* touching upon new conditions arising from the adoption of larger cars, having greater capacity, and their relation to the cast iron car wheel in general. Mr. P. H. Griffin of the New York Car Wheel Works, Buffalo, N. Y., whose opinion is certainly entitled to great consideration from his long experience in car wheel making takes exception to some of the statements made in our contemporary and writes as follows to the *Railroad Gazette*:

"The article on cast iron wheels for heavy coal cars is undoubtedly based on results obtained from an ordinary quality of chilled wheel in 50-ton service, and would give the impression that all chilled wheels are subject to the same difficulties in such service.

"While it is not the intention of the writer to open a discussion on the comparative merits of chilled wheels and the material from which they are made, or the practice attending their

manufacture, nevertheless the general statement made in the article referred to is not warranted by the facts and it is not right to allow a general impression to be created that chilled wheels are unfit for such service. The kind of wheels used under 50-ton cars where failures have occurred may or may not be equal to the service, but it is unfair to assume from this that chilled wheels cannot be or have not been made that would stand it.

"Fifty-ton cars were first introduced on the Pittsburg, Bessemer & Lake Erie Railroad in 1898, to carry ore from Conneaut to Pittsburg for the Carnegie Steel Company, and as the use of such heavy capacity cars was a new project, the details of construction were carefully planned and materials of the best quality were used. No difficulty appears to have been experienced in wheel failures on the Pittsburg, Bessemer & Lake Erie Railroad cars. The wheels were of special quality, made under double the ordinary test requirements, and furnished at a price that admitted of the use of a proper quality of material and order of practice in manufacture. Out of 8,000 wheels put under the first 1,000 cars early in 1898, up to the present time only about 15 have been removed, and all for ordinary causes. There have been no failures through inability of the wheels to stand the service. Eight thousand similar wheels are now being placed under 50-ton cars on the same railroad.

"Of late years the constant tendency has been toward lower prices and consequently the use of cheaper material in wheel manufacture, while at the same time the conditions of service have been continually growing more severe. There must be a point somewhere that will constitute the parting line between the ability to use cheaper wheels and the necessity of having wheels equal to the increasing demands of service. Perhaps the 50-ton car is the limit. If so, it will be necessary for the railroads to decide on the use of a better quality of wheel for such service and pay a price that will admit of the proper manufacture of the same. Between the lowest priced wheels and a quality suitable for 50-ton service the difference in the cost of material and conditions of manufacture will be from one-half to three-quarters of a cent per pound. This will add, say, $25 to the cost per car. It is not a large item considering the importance of the question, particularly if it secures satisfactory conditions of wheel service under such equipment. No doubt the difference can be cut from $25 to $20, $15 to $10, if the quality of the wheel is reduced accordingly, but that is simply a return to a practice which is already pronounced unsatisfactory.

"It has been held by some railroad companies that in the purchase of an extra quality of wheel there is not always the certainty of getting it, in reply to which it may be said that if the better quality is not paid for there is a certainty that it will not be delivered, and there is no reason why railway companies paying for better wheels should not make sure that the same are delivered. The art of making high grade wheels has not been lost, and the knowledge of how to make chilled wheels of the best quality is still a matter of current although not general practice, for the reason that wheels of this class have not been in great demand of late years.

"The whole question seems to be one of comparative economy. It will no doubt be decided sooner or later by the users of heavy capacity cars. If accidents from the failure of an ordinary quality of chilled wheels in such service involves greater expenses than the additional cost of obtaining wheels that will stand the service, the latter will certainly be called for. The extra cost of 1,000 cars furnished with wheels that will answer the requirements might not be equal to the loss sustained by the failure of one wheel of a quality insufficient for the service. The 50-ton car has undoubtedly come to stay and there is no more important detail of construction than the wheels. The responsibility of providing the latter of the necessary quality is a pressing one and it is surprising that it has not come up before, considering the large number of heavy capacity cars that have been constructed."

From the Frozen North.

Under date of December 1st Frederick Zorn, the ex-sand man of New York, writes us as follows from Nome, Alaska:

"It would be a good enterprise for some practical foundryman to establish an all-around foundry here and in Port Clarence, as these great mining camps will develop to be the richest gold mining districts on this hemisphere if not in the world for the next fifteen or twenty years to come. Here is gold everywhere but up to now few or no tools of any kind to work the gold out of the ground. Roads built over the Tundra and good machinery is what we want to get at the gold and make us and the world rich."

American Foundrymen's Association.

Dr. Richard Moldenke, secretary of the American Foundrymen's Association, has issued the following notice to the members of the association:

Arrangements have been made by the executive board to hold the sixth convention of the association in Buffalo on June 4th, 5th and 6th, 1901. The foundrymen of Buffalo have courteously volunteered to receive us, and are now making every preparation for the comfort and enjoyment of their guests.

The Niagara Hotel has been secured for convention headquarters, and all those desiring to attend are advised to reserve their rooms at once, as the city will be overcrowded during the Pan-American Exposition period. The delightful situation of this house in the residence portion of the city and overlooking the lake, makes it a very desirable stopping place, especially for those who wish to remain longer and thoroughly enjoy the attraction of the Exposition. Hotel rates are as follows: European plan, single rooms $2.00 per day each person; double rooms, two persons, $4.00 upward, ranging from $2.00 per person per day to $3.00, $4.00 and $5.00, the latter for rooms en suite with bath. An excellent restaurant at reasonable prices is provided.

It is especially desirable that members and their friends bring their ladies with them to the convention, thus not only adding to the attractiveness of the gathering, but also enabling our foundrymen to combine the more serious business of the convention with the pleasure of family visits to the Exposition. Our Buffalo friends assure us that the ladies will be well cared for and heartily welcome. The Pan-American Exposition will be at its highest glory and brightness just at the time of our convention.

Your secretary would furthermore urge the members to contribute papers for study and discussion at the coming meeting; that they write the secretary in what way he can serve their peculiar interests best in this direction. Calls have been made for papers on the following subjects: The Sand Blast; Molding Steel Couplers; Foundry Cost Accounts, preferably for Stove Work; Foundry Buildings; the relation of the Laboratory to the Foundry; Enameling Castings; Green Sand Cores; Preparation of Molding and Core Sands.

We would be glad to have papers on the above subjects and information as to who would be willing and able to write on them.

Among the Foundries.

The Kilby Locomotive & Machine Works, at Anniston, Ala., are being enlarged by the addition of a building 70x130 feet. The new part of the plant will be used as a wood working department for the construction of logging cars, which is a new feature of their business, and pattern shop.

A. Speer & Sons of Pittsburg, whose foundry and machine shops were taken over by the Pittsburg Valve, Foundry & Construction Company will build a new plow works at Carnegie, a suburb of Pittsburg. The firm went into the Pittsburg Valve, Foundry & Construction Company with the understanding that the plow business should remain for them to operate individually, and it has been decided to put up new works at Carnegie.

The Mechanics' Foundry & Machine Company, Fall River, Mass., have awarded the contract for the construction of their new foundry to Michael McNally. The main building will be 96x50 feet, and there will be an ell 15x62 feet; both are to be of brick, one story high.

The Central Foundry Company, West Anniston, Ala., are building a storage warehouse 110x150 feet.

The Solid Steel Casting Company of Chester, Pa., have received all their equipment for their new foundry and have same in full operation. They report their new furnaces are running very satisfactorily and will employ about 60 additional men.

The Sharon Steel Casting Company, Sharon, Pa., have plans drawn for a material enlargement of the foundry department of that plant. The new department will include a 30-ton melting furnace, two cranes, two core ovens and other machinery. About 75 more men will be employed, increasing the number of employes of this plant to about 400.

The old firm of Schwab & Sercomb, Milwaukee, Wis., iron founders and manufacturers, has been dissolved. The business will shortly be merged into a new corporation with a capital stock of $300,000. The name of the new corporation will be Schwab & Sons Company. It is the intention to more than double the capacity of the plant. The old foundry buildings on Clinton street are to be razed and substantial buildings will be erected in their place.

The Lynchburg Plow Company, Lynchburg, Va., who began operations in 1896, devoting most of their attention to the manufacture of cast plows and repairs, decided in 1898 to

make chilled plows their leading line. This course has proved to be successful, as sales have regularly increased, those of the last fiscal year being double those of the year previous. J. R. McWane, president of the company, has invented a steel beam hillside plow. The high full throat of this plow, aside from the strength of the beam, is referred to as commending it to the practical plowman. Since the plow was put on the market, five months ago, the company have not been able to fill orders. They are about to increase their facilities for the manufacture of steel beams.

The Huntsville Foundry & Machine Works, Huntsville, Ala., has added a two-story brick building 40 feet long to their plant, which will be equipped with machinery of the latest design. Besides pulleys, shafting, light or heavy forgings and castings for mechanical and architectural work, they manufacture the Burman duplex grate, which heats two adjoining rooms.

The Enterprise Foundry & Fence Company, Indianapolis, Ind., who recently incorporated, succeed to the business of Ellis & Helfenberger, and will continue under the same management and along the same line of work, which is the manufacture of iron and wire fencing, fire escapes, architectural iron work, etc.

The Kalamazoo Spring & Axle Company, Kalamazoo, Mich., will double their capacity. The large foundry and machine shop which adjoins their plant will be put in operation, and men are now at work putting the building in order. Their output will be increased to 5,000 tons per year and the working force increased by about 100 men.

The American Foundry Company is the name of a new concern which has been organized in Chicago to manufacture iron castings and do a general jobbing trade. The members of the new organization are Brove Frisk, lately foreman of the Atlas Foundry Co., and D. Munroe and Chas. Kissel, patternmakers, recently in the employ of the M. C. Bullock Mfg. Co., which has been absorbed by the Sullivan Machinery Co. The new company will occupy a portion of the Kurtz Foundry Co.'s plant at Claremont and Austin avenues for the present, expecting to build about May.

The Pittsburg Valve, Foundry & Construction Company, organized in Pittsburg last year, has secured the plant formerly operated by the American Steel Casting Company, at Twenty-sixth street and Allegheny Valley Railroad, in Pittsburg, which is being vacated by reason of the removal of the works of the American Steel Casting Company to Sharon, Pa. The Pittsburg Valve, Foundry & Construction Company will abandon the present plant of A. Speer & Co. on Duquesne Way, Pittsburg, removing the foundry department to Twenty-sixth street, and eventually will concentrate all their plants at that location. The consideration involved in the sale is not given out, but the Pittsburg Valve, Foundry & Construction Company bought the buildings, sidings, engines, dynamos, boilers and general equipment. The buildings are of brick and iron, the main building 180x300 feet. The new foundry will have a capacity of from 40 to 60 tons per day. It is not the intention of the company to make steel castings, but to enlarge their capacity for iron castings. The Pittsburg Valve, Foundry & Construction Company took over the following named concerns: Atwood & McCaffrey, Pittsburg Foundry & Machine Company, Limited; Schook-Anderson Mfg. Co., the foundry department of A. Speer & Sons and the pipe fitting department of Wilson-Snyder Mfg. Company. The business is that of engineers, founders, pipe fitters, and machinists. The headquarters are in the Empire Building, Pittsburg, but new offices are being erected on Duquesne Way. The officials are Henry Atwood, president; J. T. Speer, vice-president; C. A. Anderson, treasurer; Moses Atwood, secretary and sales agent, and Geo. E. Klingelhofer, general manager.

The Youngstown Engineering Company has recently been organized at Youngstown, Ohio. The new plant of this concern will be built at Hazleton, a suburb of Youngstown, and will consist of four buildings, a foundry, machine shop, engine house and pattern shop. The foundry is to be 80x100, and the machine shop 80x160 feet. H. A. Boyd will be manager of the concern, who will build cranes of all kinds and do a general foundry and machine shop business.

The Wm. Tod Company of Youngstown, O., a corporation with a capital stock of $600,000, succeeds the old firm of Wm. Tod & Co., engineers, founders and machinists. Officers have been elected as follows: Wm. Tod, president; John Stambaugh, vice-president, and Paul Jones, secretary and treasurer. The company will make extensive improvements to their plant, and will erect a large new foundry. The concern are builders of reversing engines, blowing engines, converters, hydraulic and heavy special machinery for the iron and steel trades. They have been building the Porter-Hamilton blowing engine for years, and

have installed some of these in the most important plants in the country.

The Oakland Iron Works, Second and Jefferson streets, Oakland, Cal., manufacturers of Tuthill water wheels, marine engines, boilers, etc., have leased the property, 100x150 feet adjoining their works on the south. The brick building on the corner, which is 75x100 feet, will be used as a machinery store house, and the remainder of the property, 75x100 feet, situated between two brick buildings, has been roofed over with a substantial corrugated iron roof, and will be used as an annex to their present foundry, almost doubling the molding floor capacity. Chas. S. Booth is president and E. B. Norton secretary and treasurer.

The large buildings now in course of construction at the Gruson Iron Works, Eddystone, Pa., are rapidly nearing completion. In the interior of the foundry and machine shops concrete beds are being laid for the reception of the massive machinery that is to be installed in these two buildings. In the boiler and engine rooms men are busy erecting boilers, engines, dynamos and blowers, with the requisite shafting necessary for such appliances. The engine, which will operate the dynamos and furnish the electricity for the whole plant, is of 375 horse power, and was made at the Harrisburg Foundry & Machine Shops. The dynamo is of the Crocker-Wheeler make. The blowers and fans are ready to be placed in position, and will be operated by an automatic cut off engine from Ingersoll-Sergeant Drill Co. of New York.

The Union Machine Company, Nashville, Tenn., have filed an amendment to their charter increasing the capital stock from $10,000 to $25,000.

W. E. & J. J. Brunson, proprietors of the Sumter Iron Works, Sumter, S. C., founders and machinists, are fitting up new shops, adding some new machinery.

The Washington Tool Company, Owatonna, Minn., has increased its capital stock from $20,000 to $50,000.

The Sergeant Mfg. Company, Greensboro, N. C., who are said to be the oldest foundry and machine house in North Carolina, with one exception, and who were burned out in January, 1900, are now occupying new buildings, with machinery fully installed. In the fire the foundry building containing all patterns happily escaped, so that within a week after the fire the company were able to ship a sawmill, and business was continued uninterrupted. The new machine shop building is 48x132 feet, two stories, giving double the floor capacity of the old building.

The Morgan Iron Works, Spartanburg, S. C., have contracted to supply all the castings required in building the new Hartsville Cotton Mill, Hartsville, S. C.; the Inman Cotton Mills, Inman, S. C., and also those required in the sewer system of Union, S. C.

The Royersford Foundry & Machine Company, Royersford, Pa., recently shipped one of their large combined punch and shears to the Bryden Horseshoe Company, Catasauqua, Pa. A number of their special emery wheel stands have also been delivered, four of which were shipped to the Thomas Roberts Stevenson Company, Philadelphia, Pa., and one to the Pelzer Mfg. Company, Pelzer, S. C. The Royersford Foundry & Machine Company has also entered into an extensive contract to manufacture radiators, etc., for the Fowler Radiator Company, Johnstown, Pa. The foundry and machine shops are being operated to their full capacity, and all conditions are favorable for a prosperous year.

The Tioga Foundry Company, Philadelphia, Pa., are now occupying their new foundry building, the old portion of which has been rebuilt to conform with new extensions recently made. New cranes, hoists and other mechanical means necessary for the modern foundry practice have also been installed.

The Board-Cummings Foundry Company, 2810 to 2826 Crowell street, Chicago, has under consideration plans for an addition to its plant. The new building is to be 100x250 feet and of steel and brick construction. It will be equipped with the latest appliances, and will be used partly for the manufacture of steel castings. It is probable that both open hearth and crucible castings will be made.

The Falk Company, Milwaukee, Wis., contractors and builders of complete electric railways, switches, frogs, crossings, etc., will build an addition about 200x100 feet to their foundry, which will double the capacity of that department and increase the number of employes by about 100. The contract for the structural iron has been let to the American Bridge Company.

The Featherstone Foundry & Machine Co., Chicago, has installed a new 48-inch cupola and other machinery and has increased its capacity by 20 tons per day.

George A. Reed & Son, Gloucester, Mass., iron and brass founders, have torn down their old building and have just completed a new

foundry 48x73 feet. A large crane and a new cupola have been installed.

The Landis Tool Company, Waynesboro, Pa., has recently erected a new foundry, the building for which, with an annex, is 80x84 feet. The annex is devoted to core making and castings cleaning, with washroom and sanitary closets for the employes. The building is heated with the Buffalo blower system. The old foundry has been remodeled and is now used for pattern making and storage.

The Crane Company of Chicago has in contemplation a large extension of its works on both sides of Judd street, between Canal street and the railroad tracks, provided it can enter into some arrangement with the city for the use of a blind alley at that point. The company contemplates the extension of its brass foundry and the construction of a large plant to be used for the manufacture of malleable iron. The improvements involve an expenditure of between $300,000 and $400,000.

The Hartley & Wilber Foundry Works is a new concern, composed of H. D. Hartley and J. V. Wilber, who have built a foundry and equipped same with the best of appliances at Oakville, Ind. They report the outlook as encouraging.

A force of men commenced work clearing the ground for improvements made by the Eagle Iron Works at their plant in Des Moines, Ia. With the improvement the company, who is engaged in the manufacture of all kinds of mining machinery, mill machinery, iron work and of engines and boilers, will nearly double its capacity. They expect to complete the improvements in about sixty days.

Jay H. Newbury, Goshen, N. Y., manufacturer of iron pipe fittings, gray iron castings, etc., is building a 70-foot addition to the foundry. A quantity of new machinery has just been installed, and even with this increased capacity Mr. Newbury says that he is compelled to refuse orders.

A firm known as the Banner Iron Works was recently incorporated in St. Louis, Mo., by gentlemen who were until recently in the service of the Koken Iron Works of that city. Mr. A. G. Fish is president, Chas. W. Koppen, vice-president; H. A. Frielingsdorf, treasurer, and E. C. F. Koken, secretary. The ground has been broken at Shaw avenue and Cardonelet Electric Railway tracks for a plant to cost $35,000.

The Ludlow Valve Company, at South Troy, N. Y., will, as soon as the weather permits, build an extension to their core room.

The Athens Foundry and Machine Works, Athens, Ga., who recently organized, have taken over the plant of the old Athens Foundry & Machine Works. Some new machinery will be installed, and the plant otherwise equipped for the manufacture of gear blanks, cut gears, etc., mill work, making and repairing, etc. The works will be put in operation as soon as possible. The officers are John R. White, president; J. R. Houchin, secretary; J. A. Morton, general manager.

Haring & Bogert have purchased the machine shop and business of Knapp & Son at Binghampton, N. Y. The new firm will operate a brass foundry in connection and will make a specialty of brass, bronze and aluminum castings.

The Wilkinson Mfg. Company, Bridgeport, Pa., manufacturers of automatic stokers, steam engines, condensers and pumps, has completed its new plant. The main building, of brick and steel construction, is 50x208 feet, extending along the main line of the Philadelphia & Reading Railway, and is 46 feet in height, of two stories, with a 10-foot basement, which will be used for cleaning castings, a branch which will be added during the summer. Beyond the building line the company has 140 additional feet of ground, which will permit of extensions at any time. An electric crane and elevators for hoisting heavy castings will be installed, and the whole plant operated by electricity, which will be generated in a 13x36 feet two-story building at the southwest side of the main structure. Adjoining the works is a one-story brick office building. When in operation the new plant will employ about 100 hands, or about twice as many as at present. The officers are Alfred Wilkinson, president; Joseph C. Laird, secretary and treasurer.

The Henry Roos Foundry Company, Bloomingdale road and Kimball avenue, Chicago, report their business steadily growing. They have just built a core oven 16x24 feet, and have installed new tools, which will enable them to get their work out more rapidly.

The Oswego Boiler Works, Oswego, N. Y., owned by W. M. Jermyn, has started to build a foundry for general work. The building will be 55x150 feet, with wings for pattern shop, core room and cupola room, and will be completed about May 1.

The Meadville Malleable Iron Company, Meadville, Pa., has received an order from the Pressed Steel Car Company of Pittsburg for 10 tons of malleable castings a day, ranging in weight from 10 to 100 pounds each.

A new company, known as the Iowa Iron Works Company, has been incorporated at Dubuque with a capital stock of $50,000. They will absorb the old Iowa Iron Works and shipyards, besides local boiler shops. Mr. Peter Kiene is president, Wm. Hopkins, vice-president and superintendent; F. G. Hornbogen, secretary, and W. W. Bonson, treasurer and manager.

A new concern has just been started at St. Louis, Mo., in some of the buildings formerly occupied by the St. Louis Stamping Company. Mr. E. C. Hanpeter, for twenty-six years identified with various departments of the Tudor Iron Works, with mills at East St. Louis, but who recently severed his connection with that company, has secured the building of the Stamping Company, at Second and Florida streets, extending southward to Cass avenue, and will also occupy the basement story under what was formerly the office of the Stamping Company. The space occupied by Mr. Hanpeter's factory in all will be in the neighborhood of 22,500 square feet. The factory will be devoted to the manufacture of iron and brass beds and a line of springs. The foundry will be thoroughly equipped throughout with all the latest appliances, and the power for the various machines in the plant will be supplied by Crocker-Wheeler motors of the most improved type.

The A. Y. McDonald & Morrison Mfg. Company, of Dubuque, Iowa, are moving into their new plant in that place. The foundry is 140x220 feet and the machine shop is 140x185 feet, and several large warehouses are among the new buildings erected or in process of erection.

The Charleston (Ill.) Foundry Company have increased their capital stock from $10,000 to $25,000. The number of directors is increased from five to six, and the principal office changed from Charleston to Chicago.

The Novelty Cast Iron Works Company has secured an option on a tract of land 200x100 feet, at Toledo, O., and will, it is said, cover the entire tract with buildings. The company will manufacture light iron work and will employ about 160 men. Toledo capital is interested to the extent of $30,000.

Messrs. Ragatz and Schaettgen, two well known machinists of Dubuque, Ia., have opened a general machine shop and foundry. Mr. Ragatz was for twenty-five years foreman of the Novelty Iron Works, and also served four years as foreman of the Dubuque Turbine Company. Mr. Schaettgen has worked in many of the leading shops in the west and for the past eleven years has made a specialty of creamery and separator repairs.

The concern heretofore known as the Columbus Malleable & Gray Iron Company of Columbus, Ohio, has been reorganized, changing its name to the Columbus Malleable Iron Company, with an increase in the capital stock from $25,000 to $50,000.

The Cahill Iron Works, Chattanooga, Tenn., will enlarge its plant and increase the capacity of its works at an early date.

The Bath Iron Works, at Bath, Me., has been awarded the contract for the battleship to be named the Georgia. The contract price is $3,590,000.

Mr. George Pugh, manufacturer of sash weights, Kansas City, Mo., expects to increase the capacity of his plant to almost double what it is at present.

The Dillon Machine Company, Dallas, Tex., capital stock $50,000, are incorporated by I. H. Dillon, C. H. Briggs, and L. S. Flatau, all of Dallas.

The W. R. Trigg Shipbuilding Company of Richmond, Va., will soon move its foundry and machine shop to new quarters where increased facilities will be provided.

The Marion Steam Shovel Company of Marion, O., has installed a steel casting plant in connection with their extensive establishment. The process employe l is the Roberts-Bessemer, the department being in charge of James M. Hare.

The Midvale Steel Company, of Nicetown, Philadelphia, Pa., is receiving bids for the erection of a new foundry building.

The Ideal Stove and Foundry Company will remove its plant from Daleville, Ind., to Upper Sandusky, O. A cash bonus has been raised by the citizens of the latter place to secure the industry.

The Union Foundry & Machine Company of Pittsburg, Pa., will during the summer erect a modern foundry building of steel construction to replace the one recently burned.

The Memphis, Tenn., plant of the Southern Car & Foundry Company has resumed operations.

Ford & Kimball of Concord, N. H., are building an addition to their foundry.

The Butler Street Foundry & Iron Company of Chicago, is building an addition to its foundry.

The Union Pacific Railway Company will build new shops at Omaha, Neb., among them being a large foundry.

The Fairhaven (Wash.) Foundry & Machine Company has purchased additional ground with a view of increasing its facilities at that point.

The Dilley Foundry Co. of Pine Bluff, Ark., will erect a new foundry 50x140 feet. Several large contracts have been awarded the firm and their present quarters are too crowded.

The Southern Foundry and Machine Company is the name of a new manufacturing enterprise in Knoxville, Tenn. The company has leased the property which was formerly occupied by the Clark Foundry and Machine Company. It has started operations. The company will make a specialty of heavy castings for all purposes, and will also do a general business in foundry and machine supplies, and will manufacture all kinds of brass castings. The officers are: F. D. Griffiths, president and treasurer; W. Boright, secretary and manager; W. T. Stamps, superintendent.

The Hess-Snyder Company of Massillon, O., capital $250,000, has been incorporated to make furnaces, etc., by J. F. Hess, Fred H. Snyder, Jacob F. Snyder, Charles F. Snyder and Frank H. Snyder.

The Two Rivers Iron Works at Two Rivers, Wis., is to be sold.

The Wisconsin Machine and Foundry Co., has been incorporated at Milwaukee, Wis., with a capital stock of $25,000. The incorporators are Lyman G. Wheeler, L. C. Wheeler and E. E. Warner.

The Parrot Manufacturing Company of Carthage, Mo., has filed articles of incorporation with a capital of $20,000.

McKenna Bros. Brass Company, Limited, Pittsburg, Pa., has had plans drawn by J. T. Steen, an architect of that city, for the erection of an eight-story power building, to be built on First avenue and Ross street, Pittsburg. The plot measures 160x84 feet, and the new building will occupy 100x84 feet.

C. M. Hilliker of Akron, Iowa, is trying to interest others in joining him to establish a foundry at that point.

W. F. Pott's Sons & Co. of Philadelphia, are having plans prepared for a large foundry building to be erected at Fifteenth and Spring streets.

The Harmony Grove Foundry, Harmony Grove, Ga., has its plant nearly ready for occupancy. It is capitalized at $5,000.

The citizens of Athens, Tenn., are clamoring for the establishment of a foundry and machine shop at that place.

The foundry at Fredericktown, Ohio, hitherto owned and operated by W. S. Cumming, has been bought by C. W. Cline of Crestline, O., and J. B. Foote & Co., of Fredericktown, Ohio.

F. E. Nelson & Son have purchased a site at Marshfield, Oregon, upon which they will erect an iron foundry and machine shop.

The Heinns & Klagemann Machine Works of Glen Este, Ohio, has leased the Dawson foundry at New Richmond, Ohio, and will hereafter supply themselves with castings.

The Universal Steel Company has been incorporated at Jersey City, N. J., to carry on a steel foundry. The capital stock is $300,000, with the following incorporators: William W. Montgomery, M. C. Pager and Joseph Reynolds.

The Watsontown Foundry Company has been launched at Watsontown, Pa., with a capital stock of $10,000.

Laurel, Miss., is to have a foundry and machine shop.

It is stated that the Stanley Rule & Level Company of New Britain, Conn., expect to put up a new foundry building in the spring.

The Mason Foundry & Machine Company has been organized at Mayfield, Ky., with a capital stock of $10,000 and the following officers: G. T. Fuller, president; Harvey Lowe, secretary, and A. N. Mason, manager.

The Galland-Henning Pneumatic Malting Drum Mfg. Company of Milwaukee, will erect a new foundry to cost $4,000.

Miller & Drury have started a foundry at Gladwin, Mich., and will carry on a general jobbing and repair business.

It is reported that Adam Roley & Sons of Basil, Ohio, will establish a foundry at Marysville, Ohio.

John Whitesides has started a small foundry at Chattanooga, Tenn.

The Canton Saw Company of Canton, O., has entered the foundry business, employing quite a number of hands.

Ebi & Neuman of Davenport, Iowa, have sold their plant in that city to the Wahle Machine & Foundry Co., recently organized.

An establishment for the manufacture of plumbers' supplies has recently been started in Cedar Rapids, Iowa. Frederick Erickson is president and Louis Kruber secretary.

The foundry of the Bliss Heater Company, at Bushnell, Ill., has been leased to J. C. Wigert & Bros., who will continue the same.

President J. E. Bell of the Carthage Foundry & Machine Company has sold a one-fourth interest or one-half of his share in the foun-

dry to I. T. Robinson, who has been elected vice president and general manager. Mr. Bell retires from the active management and will henceforth devote his time to some other line of business not yet decided on.

The firm of Bossert & Knapp are associated to do business under the style of the Coshocton Iron Co., at Coshocton, O. They have purchased what is known as the Old Mine car plant at Coshocton, and propose to make a general line of light gray iron castings, machine molded a specialty. Both have been with the S. Jarvis Adams Co., of Pittsburg, for about 15 years. They are putting in a new boiler and making some other improvements at the plant at Coshocton.

The New Castle Stove & Range Company of New Castle, Pa., has applied for a Pennsylvania charter with a capital of $500,000. The new company will manufacture stoves, ranges and all kinds of heating and ventilating appliances. The incorporators are William Patterson, George W. Johnson, C. H. Aikens, and Charles J. Kirk.

The Schillinger Stove Co., Syracuse, N. Y., has been incorporated with capital of $20,000 Louis Schillinger, Jr., L. J. Schillinger and J. T. Shea are directors.

The Gordon Foundry & Machine Company of St. Joseph, Mo., will build a new foundry and machine shop to cost $10,000. A. J. Brunswig is manager.

Fires.

Fire destroyed the entire foundry, with flasks and patterns, of Mayer Bros., at Mankato, Minn. Their machine shop with contents was also badly damaged. The estimated loss is $9,000 covered by insurance. They expect to rebuild at once.

The new plant of the Kohler, Hayssen & Stehn Mfg. Co., manufacturers of enameled ware, Sheboygan, Wis., was destroyed by fire February 17. The loss is estimated at $175,000. The plant will probably be rebuilt. The company are still operating their old factory in the city. The plant burned down was at Riverside, a suburb.

On February 28 the warehouse, covering about 2 acres, of the Dayton Malleable Iron Company, Dayton, Ohio, was destroyed by fire, entailing a loss of several thousand dollars. The buildings will be reconstructed at once.

The foundry of the Roanoke Machine Works at Roanoke, Va., was slightly damaged by fire February 24. A hot casting is supposed to have been the cause.

The brass foundry of Henry A. Hamlin at Minneapolis, Minn., known as the Pioneer Pattern & Model Brass Works, was damaged by a recent fire.

The Gray Iron Casting Company of Springfield, Ohio, had their foundry somewhat damaged by a fire, supposed to have started from the core oven.

Selby & Youlders foundry at Kingston, Ont., was partly destroyed by a fire, the origin of which is thought to have been a spark from the cupola.

The Olds Motor Works at Detroit, Mich., were completely destroyed by fire March 9. Water also did some damage to a portion of the stock of the Detroit Stove Works adjoining the burned property.

The New York Car Wheel Company's foundry at Buffalo, N. Y., was burned March 6 entailing a loss of $100,000. The fire started in the vicinity of the cupola. As the company is closely affiliated with plants in other cities the fire will cause no serious delay.

The foundry and machine shop of Gordon & Brown at Moundsville, W. Va., were destroyed by fire March 10. The loss is estimated at $10,000.

Personal.

Wm. Pech, who has been manager of the Pech Foundry Company at Le Mars, Iowa, for the past year, has become a full partner in the concern.

It is announced that P. H. Kane will sever his connections with the E. P. Allis Company not later than April 1st, and will devote his entire attention to the interests of the Lake Erie Engineering Works at Buffalo, N. Y., of which he is superintendent and a large stockholder.

Paul G. Rahe, manager of the Phoenix plant of the Central Foundry Company, at Lansdale, Pa., has been appointed to a similar position at Medina, N. Y., where he will take charge of the three foundries belonging to that company.

W. E. Warner, formerly foreman of the foundry of the Ohio Brass Company, Mansfield, has accepted a similar position with the Western Tube Company, Kewanee, Ill.

Henry Thoele, proprietor of the Florence (Ala.) Stove Works, has been elected as alderman in that city.

John C. Wuerful, general manager and treasurer of the Toledo (Ohio) Foundry &

Machine Company, has been talked of as a candidate for mayor of that city.

J. G. Sadlier, the genial manager of the Springfield (Ohio) Foundry Company, has been proposed as a candidate for mayor of that town.

T. C. Neal, who has for several years been president and superintendent of the plant of the National Steel Castings Company at Montpelier, Ind., has resigned. He is succeeded by G. Max Huffman, of Fort Wayne, Ind.

For the past two years Michael D. Waldron has been foreman at the Wheeler plant of the International Heater Company at Utica, N. Y. He has now severed his connection with that company to become general superintendent of the manufacturing plant of the Utica Heater Company. The latter company has been organized only a little over a year, but during that time has taken an enviable place in the front rank of the furnace industry in Utica, with a constantly growing business.

Deaths.

Thomas Wren died at Pottsville, Pa., February 15 at the age of 78. He was a native of Glasgow, Scotland. Many years ago he established the Eagle Foundry at Pottsville and in 1850 founded the Washington Iron Works in the same town. Mr. Wren was also interested in mining and in banking enterprises.

Patrick Flood, superintendent of the Central Union Brass Foundry, St. Louis, Mo. died on February 5 of heart disease. Mr Flood was a well-known figure in the local foundry trade of St. Louis.

Horace Silsby of Seneca Falls, N. Y., vice president of the American Fire Engine Company, died February 5, at Seneca Falls, from pulmonary disease, aged 61 years. He was born at Seneca Falls and was the eldest son of H. C. Silsby, founder of the Silsby Steam Fire Engine Works, which he organized nearly 50 years ago. From his youth Horace Silsby had been connected with the concern, and since the consolidation of the various fire engine concerns under the name of the American Fire Engine Company, he had been vice president of that corporation and manager of the Seneca Falls plant. Mr. Silsby served with distinction in the Civil War.

James M. Smith, formerly head of the firm of Smith, Whitcomb & Cook, foundrymen and manufacturers of stone cutting machinery, of Barre, Vt., died on February 23, of heart failure, at his home in Montpelier, Vt., aged 77 years. Mr. Smith retired from business about a year ago.

Peter Engel, who formerly conducted a foundry business at New Windsor, Md., died on February 24, at his home in that town, at the age of 81 years.

William Howard Carpenter, vice president and general manager of the A. Carpenter & Sons Foundry Company, Providence, R. I., died in that city March 3. Mr. Carpenter was born in Providence Aug. 28, 1861, and while yet in his boyhood he took great interest in the foundry business, in which his father was then engaged, and lost no time as soon as his school days were ended in entering actively in the work, which he had chosen for life employment. He was soon recognized as one of those energetic, broad-minded, systematic, comprehensive business men who are certain to become leaders in their chosen work if life and health are given them. Every detail of his business he became familiar with, and every customer he became cordially acquainted with. The workmen in the shop first welcomed him as a fellow workman, then respected him as foreman and finally honored him as owner and manager. With such assistance as he thus brought to his father's business, it was but natural that it should grow and that the works on Cove street should be enlarged. A partnership was formed in 1889 and later incorporated under the name of A. Carpenter & Sons' Foundry Co., in which William H. Carpenter became vice president and general manager, a position he held at the time of his death.

John Baillie Falconer, a retired iron-founder, of Dundee, Scotland, died recently, aged seventy-two years. The deceased, in partnership with his late brother, Charles, formerly carried on the Falcon Ironworks there.

Ezra T. Converse, who at one time conducted a foundry at Staffordville, Conn., under the name of Howe & Converse is dead aged 82.

M. M. Martin, master car builder of the Wabash Railroad, and one of the chief stockholders of the Litchfield Car & Machine Co. at Litchfield, Ill., died at that place recently at the age of 70.

Thos. Needham, for nearly forty years engaged in the foundry business at Derby, England, died there recently, aged 73.

William W. Smith of the firm of Smith & Smith, proprietors of the Eagle foundry at Lowell, Mass., is dead, aged 37.

The Sampling and Grading of Pig Iron.

BY HERBERT E. FIELD.

The article by Mr. W. G. Scott in the February *Foundry* brings forward too important a subject to be passed without notice. A further discussion of the proper sampling of pig iron may help to adjust some difficulties and differences now laid to other causes.

The lack of uniformity in results obtained by the chemical analysis of the same sample by different laboratories is a subject which has been worn too threadbare to need any discussion here. It has been made the corner stone for many articles written in opposition to the method of mixing iron by chemical analysis and is the chief argument used by many a pig iron agent when their iron does not come within the limits guaranteed. During a recent correspondence in regard to a lot of iron which had not come within the specified requirements, the following example was cited by the agents through whom the iron was bought, in order to show how little dependence could be placed upon the chemical work done by different laboratories.

A quantity of iron was bought upon specified analysis, for silicon and phosphorus. Upon receipt of this iron the founder took borings from several pigs, mixed them together and sent parts to two different laboratories. The report from these chemists showed a variation of over a quarter of one per cent in silicon and over eight-tenths per cent in phosphorus. As these results were so widely at variance and as they did not come within the requirements of the contract, 25 more samples were taken at the request of the agents. These were mixed together and portions sent to a standard chemical laboratory and to one of the chemists who analyzed the original samples. The reports from these two lots again showed a variation of over one-quarter of one per cent in silicon. The founder having saved a part of the sample, sent it to the above-mentioned chemist for a third analysis, and the result again varied over one-half of one per cent in silicon. No one familiar with chemical analysis can believe that there could be such a difference in the results of one chemist's work, and this forces us to draw the conclusion that the difficulty must have been due to the lack of uniformity in the samples. The method mentioned by Mr. Scott in his February article, of taking an equal portion from each sample and mixing them together was the one used in the above instance. This method has been and is, in general use in most laboratories. Several years ago I had considerable trouble along this same line and found that it was due wholly to this method of mixing samples. I found that it was impossible to sufficiently mix any number of samples so that the small quantity taken for analysis could give anything like an average of the lot. For some time after this I insisted on a separate analysis of each sample taken, and still hold to this method when possible as the only way to determine whether a quantity of iron "runs even" or not. In many cases, however, I found this impracticable on account of the time consumed and I have adopted the following method which has all the accuracy of the individual analysis and falls short only in not showing the variation in the quality of the iron. When the iron is received in carloads, five samples are taken from each car representing as nearly as possible the average fracture of the car. After the sand has been thoroughly cleaned from the outside, the pig is broken and wrapped in strong paper and tied securely near the fresh fracture end to prevent any loose sand which may be disengaged from the outside of the pig getting into the sample. The drillings are then taken half way between the center and outside of the pig, those from each pig being separate and powdered in a mortar. If there are for instance, five samples from a car to be analyzed, one-fifth of each charge used in the analysis is taken from each sample. For example, if it is a silicon analysis, and a one gram charge is used, one-fifth of a gram, or .2 gram, is weighed from each sample. If it is a sulphur analysis, for which a five gram charge is to be taken, one-fifth of five grams, or 1 gram is weighed from each sample. In case a larger pile of iron is to be sampled, more pigs should be taken and a proportionate part of each charge taken from each sample. This is very accurate up to ten samples, but it is hardly advisable to use less than one-tenth of a gram from any one sample for an analysis. If more than ten samples are to be taken, two separate analyses should be made. In order to show the accuracy of this method, I have made many average analyses in this manner, and then analyzed each individual sample and taken the average of the result and have always found the two extremely concordant. The following table will show as plainly as any I have how closely these results agree, and will also answer for an illustration which I wish to bring out later in this article.

These twenty samples were taken from a pile

of iron in a foundry yard, and were sold as a first-class No. 2 Southern iron. The foundry had considerable trouble with their castings, and I was called in to help them out and found this lot of iron. The fractures I have affixed for further mention and have designated the appearance rather than try to put a number to the fracture:

Detail analysis for silicon, phosphorus and sulphur arranged in order of silicon percentages.

Sample No.	Fracture.	Silicion.	Phosphorus.	Sulphur.
1	High Silicion	5.342	1.082	.0277
4	Silvery	5.178	1.336	.111
3	Silvery	5.107	1.353	.127
2	Silvery	5.056	1.293	.0741
12	M. Close	3.851	1.643	.092
20	Close	3.850	1.590	.0667
13	M. Close	3.836	1.019	.0422
11	Medium	3.662	1.661	.0576
8	M. Open	3.629	1.027	.0495
16	Close	3.555	.984	.06
7	M. Open	3.396	1.501	.0232
17	Close	2.258	1.441	.0633
9	Open	2.80	1.310	.0624
18	Close	2.614	1.300	.0321
6	Open	2.348	1.030	.0216
14	M. Close	2.332	1.429	.0071
15	Close	2.158	1.055	.0421
10	Medium	2.085	1.098	.0374
5	Open	2.062	1.139	.0142
19	Close	1.881	1.021	.0333

Two average analyses were made, one of samples Nos. 1 to 10, the other of samples Nos. 11 to 20, with the following result:

	Silicon	Phosphorus	Sulphur
Average of individual analysis 1 to 10 (from above table)	3.700	1.217	.055
Average analysis Nos. 1 to 10	3.672	1.193	.061
Difference	.028	.024	.006

	Silicon	Phosphorus	Sulphur
Average of individual Nos. 11 to 20 (from above table)	3.10	1.315	.0496
Average analysis Nos. 11 to 20	3.166	1.316	.0489
Difference	.066	.001	.0007

These results show conclusively how very accurate this method of average analysis is, and I feel sure that if it were adopted in more of our laboratories there would be less complaint of the varying results of different chemists.

The article of Mr. Kirk in the February *Foundry* ably supports the mixing of iron by fracture and leads me to refer to the above table to show an instance where this method of mixing iron would not only be impracticable, but would, and did, lead to very disastrous results. A close scrutiny of the table will show that with the exception of the high silicon and silvery fracture, there is practically no uniformity between the fracture and the analysis. There are many fractures of iron which it is possible to distinguish by appearance, but there are others which are more difficult, and in fact impossible to grade or mix by that method.

A close grain, caused by high sulphur, and one caused by low silicon are many times identical in fracture, and yet would give very different results if one were substituted for the other. The high manganese, high carbon pig iron often has a fine No. 1 fracture, with its identical color, and rich appearance, and yet it can, in no way, be used for the same work. The No. 2, soft iron, manufactured by the Southern furnaces, frequently has a fracture which is identical with the No. 3, of the Northern furnaces, yet their effect in castings is entirely different. The rapid increase of the number of firms employing chemists and mixing iron by chemical analysis shows that the method is a necessity to the modern foundry and is becoming more so as furnace practice develops. A comparatively few years ago the furnaces considered that only certain kinds of ore could be used in the manufacture of pig iron, but as the iron industry developed, new ores were tried and new conditions arose. There are still furnace men who are using the old standard ores and turning out the same reliable pig iron, but at a price which makes it impossible for the modern jobbing foundry in the competition of the present, to use. With such an iron it would be comparatively easy to get good results by the fracture method of mixing, but it has fallen to the lot of chemistry to make use of the cheaper irons made perhaps from inferior ores. By judiciously selecting from these irons, a mixture may be made, by analysis, at a much less cost, which will equal and often improve upon those made from the more expensive iron.

The hardness test which has been recently alluded to in *The Foundry*, shows but little improvement over the fracture method for testing the raw material. It could, however, be made very useful in testing the iron on the day following the cast, and thus prevent the delay caused by waiting for castings to reach the machine shop before the hardness is known. The high silicon pig iron would show a great hardness with this test, and yet in appropriate amounts would act as a softener. The same is true of the high manganese, high carbon pig which is extremely difficult to drill, and yet if properly mixed softens certain kinds of iron.

Many mechanical methods for mixing irons have been tried and rejected in our foundries while the increasing popularity of the chemical method indicates that it will eventually be the

sole method of mixing iron. The method of sampling before mentioned will be found a great aid to more uniform results.

What Would You Have Done?

There are times when a man's judgment must act quickly to be of service, and when the conditions are of such a nature that he has no previous experience to guide him.

These are the times when a thorough knowledge of fundamental facts and a cool head are of service.

A very unusual combination came about in a small foundry one day that you might travel far to find equaled.

The foundry stood on bottom land some distance back from a good sized creek, which at this time was filled with floating ice. Shortly after the fire was built in the cupola the ice gorged in a narrow spot some distance below the shop.

The creek was running at flood height and several little gorges had broken farther up, letting out more water and ice, and so still farther increasing the amount of water coming down.

It was unusual for the ice to stick at the place it did and at first it was expected to be only a short stop, but this time the ice coming after seemed to strike in a way to lock the whole mass securely and the water began filling the flats at a rate that was alarming.

The word came to the foundry just as the iron began to come down and the effort was to crowd things so as to get it out of the way before the water got there. This, it was believed, could be done, as the heat was small. As the first ladleful was being poured the water showed in one corner. In a few minutes it had spread over most of the floor, and the last mold to be poured was wet over the bottom board before the mold was full, and all hands (two men and three boys) decided that it was getting too risky, and got outside to a roadway that was two or three feet higher than the floor to hold a council as the water rose higher every minute.

Every one realized that whatever was done must be done quickly and the molder in the group was looked to for advice.

What will happen when the water gets up and into the cupola? "Happen?" yelled the molder, looking around for a way to run, "Why, this part of the town will be blown into millions of pieces; there won't be anything left; we've got to get that iron out somehow or other."

This you can be sure didn't help to make things any quieter and what to do was in every one's mind.

It must have been habit that suggested the remedy. "Drop the bottom, quick," some one yelled. "Get a pole or board or piece of pipe," and the crowd scattered in search of something still above water.

The water by this time was less than a foot from the bottom of the cupola.

A joint of pipe was found and thrust through a crack in the building and careful aim taken at the iron that held up the bottom doors.

You can well believe that no time had been taken to think.

After two or three passes the iron received a fair blow and the bottom came down.

Luckily the hinges of the door were toward the men. To describe the scene would be impossible. It seemed as though a huge blunderbuss had been fired into the air, which was filled with flying iron and coke for what appeared to be several hundred feet in height, and acres in diameter.

The streets were filled with people who fled in all directions trying to get under cover before the burning material reached the earth and them.

As it was nearly six in the evening and quite dark it attracted attention from everywhere, and the fire department soon put in an appearance and began laying hose. They felt sure everything would be one fire, but in this they were mistaken.

No fire was started anywhere, and as far as could be learned no one was burned or harmed in any way except from fright. Neither was there any iron found under the cupola or anywhere else.

An examination in the morning showed the cupola thrown from its place and laying on its side, the roof of the foundry turned completely upside down, but not moved much either sideways or endways. The gas in the near neighborhood was blown out by the concussion.

The water was all down before morning and the columns the cupola had set on showed that the highest water had been three or four inches below the cupola.

The amount of damage done was not great but the excitement was intense for a short time.

Several things connected with it have often come to my mind that I have never had straightened out. The first is: Did the melted iron burn up in the air when thrown up from the water? The brilliant light and the fact that people were not burned with its falling on them seems to indicate that it was.

What would have happened if nothing had been done and the water had arisen into the cupola?

The cupola was small and there was supposed to be about 400 pounds of iron in it when the bottom was dropped.

Then comes the question, What would have been the best thing to do? This of course, believing the water would surely get into the iron.

Of course, as it turned out, shutting off the wind and doing nothing would have saved the blow up.

Presence of mind and experience are great things sometimes, but somehow when something entirely unexpected and seemingly very dangerous suddenly confronts us, we are so apt to try to think of some way to bring about absence of body in a rapid manner that we do not think as clearly on other matters as we should. W. OSBORNE.

Erratic and Systematic Grading of Pig Iron by Analysis.*

THOS. D. WEST, SHARPSVILLE, PA.

In this paper it is intended to call attention to the present rather erratic methods adopted in grading pig iron by analysis, and to deduce principles whereby standards for such grading could be established. In this way a fair idea could be formed in regard to the physical properties which may be expected from different brands of pig iron, wherever they are referred to by numbers. The erratic and unsound manner in which the grades of different brands of pig iron are now numbered cannot be better brought out than is done in the recent book entitled "Analyses of Pig Iron," by Mr. Seymour R. Church. In this work, we find pig irons called No. 1 by their makers and ranging in silicon from one-half of one per cent (.50) to four per cent (4.00), furthermore the wildest kind of confusion as to numbers and trade marks, etc., supposed to designate the special qualities of the different grades of pig iron reported.

The distinction between the terms "brand" and "grade" of an iron may be stated to mean that a "brand" is supposed to possess chemical or physical properties not met with in their entirety in another kind of iron, while the "grades" of an iron are the different degrees of hardness obtainable from any special brand when run into similarly shaped castings.

To illustrate the present impracticable and meaningless habit of numbering grades of pig iron when grading and selling by analysis, the writer presents the chart below. Every line stands for a range of one-fourth of one per cent in silicon in the composition. The length of the heavy black lines represents the relative number of analyses giving the different percentages of silicon in irons called No. 1, as found in Mr. Church's work. Coke irons are shown on the left and charcoal irons on the right. It is to be understood that this paper is not a criticism on the book "Analyses of Pig Iron," but rather on the absence of method and standards in such a grading of pig irons by analysis.

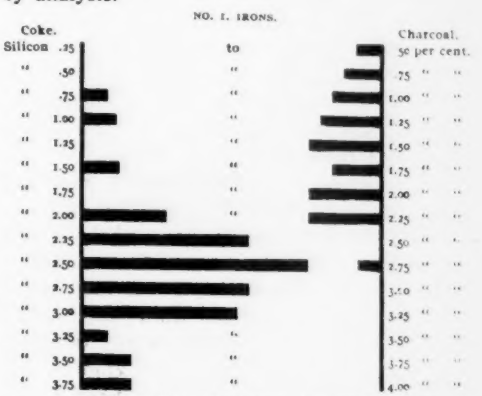


CHART SHOWING ERRATIC GRADING OF PIG IRON IN 1900

The general conception by foundrymen of a No. 1 pig iron is that it refers to that grade of iron which is best adapted, when melted by itself, to give soft iron in castings ranging from 1 inch thickness down to stove plate. Then again, genuine No. 1 iron is more expensive to make than a No. 2 or 3. This is due to the fact that a No. 1 iron must contain more silicon than a No. 2 or 3, and the higher the silicon, the more fuel is necessary to make it. When we read the market reports of pig iron prices we generally see them quoted as No. 1, No. 2, No. 3, etc. If one furnaceman calls an iron containing but .50 per cent of silicon a No. 1 iron and another calls a 4.00 per cent silicon iron No. 1, what is one to understand by such terms, and what endless confusion and loss must not such a practice cause?

The writer has stated in other publications that there is no really bad iron, meaning that there is a market for all brands and grades of pig iron. This being accepted, it cannot profit any furnaceman in the end, to intentionally dispose of iron to a customer which may not be best suited for his work. Furnacemen are not the only ones to blame when their customers

*Proceedings American Foundrymen's Association.

receive iron not suited for their purpose. Unfortunately too few buyers know what they should use, and hence, between the two. there is much to be remedied. However, the writer looks for the day when almost if not all irons will be shipped just where they will do the work they are best suited for. This cannot be fully realized until furnacemen will not only furnish chemical analyses as they now do, but also physical tests of their pig iron after it has been remelted in a small cupola. These physical tests should give the strength, deflection, contraction, chill, and fluidity of their pig irons, as obtained by a practical and standard system of testing The data derived from such tests would not only show up the difference in the various brands of iron, but would also enable users to obtain the grades (by a uniform or standard system of numbering these) in any special brand which will best suit their requirements.

All progressive furnacemen and founders now work under the rule that silicon and sulphur are the elements which control the grading of iron by analysis, ores, flux, and fuel being similar. This principle was first advocated by the writer in his work "Metallurgy of Cast Iron." It also allows the devising and establishing of standards in grading pig iron by analysis which can be adhered to by all furnaces making irons ranging from .50 to 3.00 per cent in silicon. The line of distinction between grades should be drawn so that the amount of silicon and of sulphur which can make a perceptible change in the hardness of castings when pig iron only is remelted is taken into account.

The writer's extended experience obtained by closely following variations in the hardness of castings due to changes in silicon and sulphur, is such that he can safely say that where sulphur is kept constant, every increase of .25 per cent in silicon should change the grade of pig iron one number in all iron ranging up to 3.00 per cent in silicon.

It takes less sulphur than any other element to effect a change in the grade or hardness of a casting. A change of one point of sulphur (.01 per cent) can neutralize the effect of eight or twelve times the amount of silicon. This will be better understood by reference to Table 1, which shows approximately the increase in silicon and sulphur necessary to maintain a uniform hardness (or a constant condition of the carbons) in remelted pig iron. This can only be observed by melting pig iron in a cupola at the furnace or in the foundry, to make test bars or castings. In brief, Table 1 shows that, if an iron containing 2.00 per cent silicon should have its sulphur increased from .01 to .06, in order to maintain an approximately equal hardness in similar test bars or castings, the silicon would have to be increased .50 per cent.

TABLE I.

Sulphur	.01	.02	.03	.04	.05	.06
Silicon	2.00	2.10	9.20	2.30	2.40	2.50

As a rule in coke irons the lower the silicon the higher the sulphur. In establishing standards the amount of sulphur, therefore, should be considered as well as the silicon. Recognizing this fact in connection with the statement given above, which makes a distinction in grade at every .25 per cent of silicon, Table 2 is presented for consideration in discussing standards for the numbering of grades. One may thus form some fair idea of the hardness to be expected in castings from pig iron when ordering No. 1, 2 or 3 in different brands of iron.

TABLE II.

	No. 1 Iron.	No. 2.	No. 3.	No. 4.	No. 5.
Silicon	2.75 to 3.00	2.50 to 2.75	2.25 to 2.50	2.00 to 2.25	1.75 to 2.00
Sulphur	.01 to .02	.01 to .03	.01 to .03	.01 to .04	.02 to .04
	No. 6.	**No. 7.**	**No. 8.**	**No. 9.**	**No. 10**
Silicon	1.50 to 1.75	1.25 to 1.50	1.00 to 1.25	.75 to 1.00	.50 to .75
Sulphur	.02 to .05	.03 to .05	.03 to .06	.04 to .07	.05 to .10

Numbering the grades from No. 1 to No. 10, advancing in silicon .25 and sulphur .01 to .03 or more in each grade, as shown in Table 2, gives a range that may be said to include all the necessary ones that are now used in making castings, except the so-called softeners or ferro-silicons. It will be noticed that the suggestion for grading pig iron as given herewith arbitrarily starts with No. 1, an iron containing from 2.75 to 3.00 per cent of silicon. The majority of furnacemen happen to grade pretty closely to this standard, as is shown by chart, which gives the greatest number of irons graded as No. 1 as containing 2.50 to 2.75 per cent in silicon.

When purchasing ferro-silicons or softeners, their exact composition should be obtained, as indeed should those of any grades in No. 1 to 10 irons given in Table 2, so that when using

any of the grades by these tables they could be handled intelligently, and give the founder exactly or very closely the quality desired in his castings.

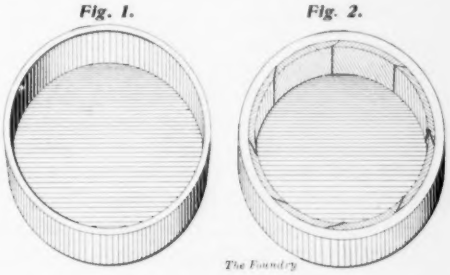
The phosphorus, manganese, and carbon contents, it will be noticed, is not touched upon in any of the above tables. These are ingredients which are fairly constant in all brands of iron made from similar ores, fuel and fluxes, and what slight changes may occur in them can affect the grade of any brand of iron very little. While this is a fact, it would generally be advisable for furnacemen in advertising their irons to state along with the brands named, what percentage of phosphorus and manganese and in some cases, total carbon, their iron contains, as there are conditions demanding varying percentages of these elements met with that would enhance the irons were these points made known. As for example, a founder making very thin castings would require higher phosphorus, which gives more fluidity to iron, than is available in some regular No. 1 grades. Then, again, it is often necessary to know what manganese an iron contains, as when it is more than .50 its influence is to harden. With regard to the carbon, the "total" is all that is generally required. Giving the percentage of what is combined or free carbon in iron tells nothing further than the melting qualities of the metal. In this the more the carbon is combined, the easier or quicker the iron melts, a fact discovered by the writer several years ago and confirmed by Dr. R. Moldenke, by further experiment. If a knowledge of the combined or graphitic carbon contents of pig iron was of any real value in grading pig irons by analysis, grading could be done effectively by fracture or hardness, and the only determinations required would be those of the total carbon, phosphorus, or manganese, according as information might be desired of one or all of these ingredients.

By bringing forward the suggestions herein outlined for grading pig iron by analysis, a way is opened up whereby it is hoped that much good will result. This is a good subject for discussion by furnacemen as well as founders and could be adapted for further ventilation at the coming convention of the American Foundrymen's Association where the greatest number of those interested would meet. The work of this association in helping to bring about greater uniformity in the chemical analysis of irons by preparing standardized drillings (now in use in nearly two hundred of our leading laboratories), also in testing the various grades of cast iron is recognized as having been productive of much good. It therefore seems to the writer that this same association could also exert a beneficial influence in bringing about greater uniformity in the grading and selling of our foundry irons.

A Small Malleable Job.

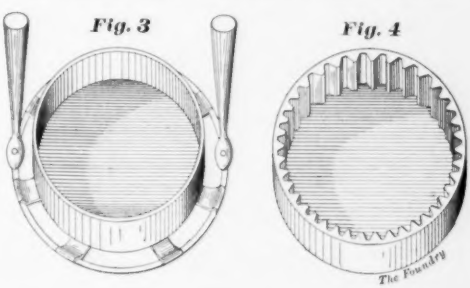
At the first glance a molder would be tempted to declare this a very simple casting to get out, but if he has had any experience with malleable iron and will note carefully what the machinist has to do to this casting, then he

Fig. 1. *Fig. 2.*



will know what was expected. Fig. 1 shows the pattern, the dimensions of which are 8 inches diameter, with 3-inch flange, ⅞ of an inch thickness throughout. The inside of the flange has to have teeth milled into it, ½ inch

Fig. 3 *Fig. 4*



deep, 8 teeth to the inch, and to leave when finished a shell ¼ inch thick. As can be readily seen the slightest flaw or shrinkage would condemn this casting after a machinist had worked perhaps all day on it. It will be noticed (Fig. 2) that the entire inner surface is covered by 8 chills, but owing to their shape when contraction begins, they will not burst the casting. Fig. 3 shows how it was gated on the bottom edge of flange, a split ring-runner with feeders on at every point where iron entered the mold, acting not only as feeders but slag catchers also. Fig. 4 shows what the casting looked like when they got through with it in the machine shop.

Syracuse, N. Y. WM. H. KING.

Percentage of Loss in Melting.

The writer would like to ask the opinion of the experts who read *The Foundry* as to what their experience shows the loss to be in melting iron. In other words if 2,240 lbs. of pig iron is charged in the cupola, how many pounds of castings and sprues can be obtained from same? Also out of same quantity of stove plate scrap?

My experience has been that there is a loss of approximately (10 per cent) in pig iron and considerably over this in stove plate scrap. The loss is accounted for mostly by the slag In talking this matter over with other foundrymen some time ago, they seemed to question this amount of loss and made a small sample heat purposely to get at the exact loss. They reported that out of 1,000 lbs. of stove plate scrap they produced 976 lbs. of castings and sprues, or a loss of under 2½ per cent. They claim that this experiment and figures are absolutely correct, the proprietor himself weighing the entire quantity. They take the ground that stove plate scrap had considerably less loss attached to it than pig iron. This experiment was a great surprise to the writer and he can only account for it from the fact that they must have used a very clean stove plate free from rust. E. L. GROVER.

Big Work in Small Shops.

We have often expressed the opinion that in reality the greatest piece of foundry work was not done in the largest shop. The molding and casting of the heaviest piece of machinery is a comparatively easy job to what it is to turn out a casting half the size with no facilities.

L. E. Lelaurin, foreman of the Dilley foundry at Pine Bluff, Ark., writes that he is making locomotive cylinders, weighing from 2,600 to 4,500 pounds in green sand, two molders casting one every other day with the assistance of a helper on the first day, giving a labor cost for molding of $13.25. The shop is not furnished with modern equipment and all the iron is melted in a 32-inch cupola, the net output of finished castings being between eighty-five and a hundred tons per month.

IN our February issue appeared an item to the effect that the Canton Roll & Machine Co. of Canton, Ohio, had transferred their plant to the American Sheet Steel Co. Mr. J. B. Baird, president and manager of the former company, writes us that this statement is incorrect and that his company has no connection with any other corporation.

Fitting Up a Brass Foundry.

The most important things in designing a building to be used for a brass foundry are light and ventilation. Insufficient ventilation will permit the gases from the furnaces and the fumes from the metal to be retained in the shop, the men becoming drowsy and languid, and consequently doing less work, while a dark shop means a large gas bill. A shop built on the ground will allow the furnaces to be placed in a pit, and this is a distinct advantage. Receptacles for sand and fuel should be thought of and placed where they can be easily got at, both in winter and summer.

In this article, the internal arrangement of a brass foundry, rather than the building, will be considered, the idea being to furnish parties desirous of starting a small jobbing foundry with instructions that will enable them to build the molding troughs, lay the casting floor and skimming hearth, arrange the furnaces, emery wheels, tumbling barrels, etc.

In large cities brass foundries are often found in the upper stories of power buildings, and we will suppose we have rented a room or loft on the top floor of such a building, and that we contemplate doing sufficient business to run six molders. We first decide upon the position of the furnaces and locate them at the end of the room nearest the elevator. We next consider the position of the molding tubs, whether to arrange them along the wall or place them back to back at right angles to the wall. Where there is abundance of room the plan usually followed is to range them along the walls next the windows. We require six tubs, each not less than 9 feet in length, and if we can make them 10 feet so much the better, for when the tubs are too small the molder is always short of sand, is continually riddling and has to use it hot, which makes it stick to the patterns and cause the castings to look rough; so we will make the tubs, say, 10 feet in length by 24 inches deep, 24 inches wide at the bottom and 28 inches at the top. For each tub we shall require six dressed pine planks 2¼ inches thick by 12 inches wide, and four of them 10 feet and 2, 10 feet 4½ inches long. The front of the tub, where the molder will stand, is made sloping. Four pieces of plank 34 inches long are sawn for the ends. We are to cut grooves in these ends, into which the ends of the back and front planks will fit, thus holding them more securely against the pressure of the sand; so we lay two of the pieces on the floor, and, leaving an inch margin, mark out a two-inch straight groove for the back;

the groove for the front is given a slope of four inches from bottom to top. Cut the groove ½ inch deep and then spike the ends in position. We have now a rectangular bottomless box; we turn it bottom up and nail on the long planks, which are of sufficient length to reach across the ends. We then place the tubs in the position we have decided they are to occupy. They are raised from the floor six or eight inches by setting them on bricks or wood of that height.

If the tubs are to stand by the wall, they are placed one foot away from the same. This will allow a tool shelf 12 inches wide to be nailed on the top edge of the back of the tub. This will project over and touch the wall and should have a ledge two inches high fastened along that edge to prevent tools from falling off. Each tub must be provided inside with a ledge, back and front, to support the skids on which the molding is done. These ledges are simply "two by fours" and run the length of the tub. Nail the front one on first, 6 inches below the top of the tub; it will be easy then to determine the height of the back one. Now, saw off for each tub two skids 2x4 inches, bevel one end to conform to the slope of the front of the tub; do not nail or fasten these skids in any way, as the molder adjusts them when he is working on any part of the tub that suits his convenience and generally removes them altogether when he riddles his sand.

The molding tubs are now complete, the next thing to be considered is the casting floor. This is best made of brick, confined within a defined space by "two by fours" nailed to the floor. This brick casting floor is not carried under the molders' feet because it is not necessary, and also is not a nice thing to stand upon. The "two by fours" are nailed down parallel with the front of the tubs and three feet distant. The space between the tub and the raised casting floor retains the sand spilled in molding and prevents its being distributed all over the shop. The whole space decided upon for casting is bounded by "two by fours" spiked to the floor. The bricks are then laid flat, breaking joints; they are bedded on sand ½ inch deep and dry sand is swept into the interstices. This brick floor should be extended to, under and around the furnaces, so that if metal is spilled fire will not result.

We are supposing that the furnaces are to stand on the floor like stoves; before laying the brick under them and along the floor adjacent, we first lay down a layer of asbestos paper. The fire regulations in some cities prescribe: first asbestos paper, on this a layer of hollow tiles and then a layer of common brick, on which the furnaces are set. When the furnaces are set each in a shallow cast-iron tray with feet two inches high, the hollow tiles are not necessary.

The part of the floor whereon the pots are to be skimmed should be carefully protected. Lay down several thicknesses of asbestos paper under the common brick at this spot, then on top of the brick floor make a "hearth." Get a tire from a wagon wheel with a three-inch face, lay it on the floor and fill it in with firebrick cemented with fire-clay. The tire retains the brick in place. This hearth should be located six or eight feet away from the furnaces and centrally thereto. If the tubs have been placed at right angles, or with their ends abutting on the wall, casting floors are generally provided for every two molders. Two tubs are placed back to back with a space of 12 inches between; this allows for the tool shelf, which is fastened on the top of each tub, bridging this space and holding the tub together. Before the shelf is nailed on, a piece of "two by four" is fastened vertically on the back of each tub. It extends three feet above the top edge of the tubs near the end at the right of each molder. This is a convenience for hanging the sieve. Between the fronts of each set of tubs there is a space of ten feet; this allows a casting floor six feet wide and a space of two feet before each tub where the molder stands. These casting floors should merge into a pathway of brick running along the ends of the tubs and reaching to the furnaces; sometimes the tubs are placed closer together and this pathway used for a casting floor.

The arrangement for illumination consists of a gas pipe suspended from the ceiling reaching down to within two feet of each tool shelf, midway of each set of tubs. To this pipe, two swivel brackets are attached, one for each molder.

The core bench and oven are sometimes located between the furnaces and the nearest molder. The bench is simply a stout table about 36 inches high, 36 inches wide and any length thought desirable. It is provided with back and sides 12 inches high. The core oven may be an elaborate affair or simply a rectangular iron box fitted with doors and set over the body of a small cannon stove. The stovepipe is carried from the top of the oven to the chimney and should be provided with a damper. Angle iron is riveted at each end

inside the oven and forms ledges to support the iron strips which are the shelves on which core plates are supported.

The emery wheels, tumbling barrels and casting cleaning bench are preferably located at the same end of the shop as the furnaces, near the elevator, for shipping conveniences.

The office of such a shop as we have been considering is usually not a pretentious affair. A space around the door is generally boxed in and provided with a roll-top desk, a telephone, safe, and book-keeper. Sometimes the office is divided by a counter before which customers stand. When visitors are undesirable the space between the end of the counter and the wall of the office is fitted with a gate through which the employes pass.

For ventilation, square cupolas with skylights are sometimes provided. One of these should be placed directly over the furnaces and one or more over the casting floor. These cupolas ought to be at least four feet high, and provided on the sides with lattices or doors opening outward and operated from the inside. A cheaper way, sometimes practiced, is to cut out a portion of a roof ten feet in length and the width of two joists. Thieves are guarded against by running ½-inch iron bars lengthwise of the opening, the same as prison windows are protected; the opening is bounded outside by a ledge, over which a waterproof lid can be fitted at night time and in stormy weather.

Proper attention to the size of the flues will prevent noxious gases from being thrown into the shop from the furnaces; if any gas is noticed, enlarge the flues. This is an item too often neglected. It has a direct bearing on the health of the employes, and consequently on the cost of production, and should receive careful attention.—[C. Vickers in American Machinist.

Chimmie Powers' Answer to Correspondents.

Papstown, Wis., Mr. Powers: Dear Sir:—I am engaged in the foundry business and doing a nice class of work, have plenty to do at all seasons of the year; employ eight molders steady, am a little bit overdrawn at the bank, on account of having to pay cash for iron and coke, and allowing the usual thirty days for customers to remit. What I want is a partner (molder prefered) with about $2,000 cash to be foreman, while I solicit, and attend to office work. You know just about what I want. Send steady, sober man. Very truly yours. Henry Short.

Yes, Hiney, I'm sure I know what you want. Yure like de Irish man what hatd holt uv a bear and wus hollerin' fur sum one tu cum an' help him let go; but I'll tell de first molder I see, dat's out uv work an' wants tu better hisself. Nearly all uv dem carries dat much "round in der jeans," so dey wont run short uv change.

Sandy Knight: To avoid trouble uv dat kind, always taste de clay wash tu see if de helpers gota nuff mud in it.

Old Foreman: 1. If yer can't get de work out fasta nuff, why don't yu use quick sand. 2. Molders ain't glass blowers because dey blow in glasses, dey do dat tu blow de foam off.

Ozark, Mo. Mr. Powers: I'm proprietor of a small foundry hyre, an now bein' as how the crops air all in, allowed I'd run up to Sent Louis, an git some foundry supplics, a couple of brushes, a riddel or two, a piece of rope for the crane, a sack of blackin' and a whole heap of stuff, may want to bring a molder back hum with me, too. O. Shaw.

Don't blow de gas out, Rube, before I gets dere, an I'll show ye de cheapest place in town tu buy brushes, an riddles, but yu needn't blow yer selft fur a new rope fur de crane, b'cause yu kin use de one dat de bull calf is tied whit: bet yu never tot uv dat.

Hamilton, O. Mr. Powers: I have a sweetheart, he is a molder and says he makes $30 a week, he has been here four months now and says his home is in Chicago, and that he has traveled all over the U. S. he is very attentive to me and Papa likes him very much. he is to get $5,000 next June so he says, at which time he says I can expect him to ask me a very important question. His name is Charles Hennessy but I call him Charley. are you acquainted with him? Elizabeth More.

Say, Liz; you better give dat tramp de "hot foot," he's givin both yu an yure old man "hot air," it don't cut no ice what yu call him, dat's "Spike" Hennessy, an I know'm well. I guess sum one's goin' tu give him dat $5,000 through a seive, nex' thing yu know he'll try tu borry money frum yer, er els he'll try to make a touch frum yer old man.

Old Jour: De paramount issue wid de molders is sixteen and a half to one, dat is sixteen dollars an a half to one week, an not sixteen to one like Bryan usta say.

Detroit, Mich. Mr. Powers: Hearing some of the molders talk, am led to believe that groceries are use' to some extent around a foundry, am I right? James Pettigrew.

Yure right, Jim; flour, molases, salt, coal oil, an potatoes are used, an some molders use de product of a brewery, dey blow beer on molds, but dats a bad habit, 'cause wen a molder gets through doin' dat he's like a wild beast whats got de taste av blud, an he generally starts tu "can up" after hes done, an keeps it up untill late, den wen he cums tu work in de mornin' yu kin hang yer overcoat on his bret.

Jersey City. Mr. Powers. Dear Sir: I am having trouble with my Cupola, and from observations recently, deduct that the tuyers are too high, because the iron is always dull during first part of heat, at which time we run the engine faster, and have on more than the usual compliment of coke, but later on we have to reduce the speed, as the iron comes too hot, from the facts I have given can you make any deductions that would overcome this trouble. Yours V. T. S. T. Bunch.

Yes, Sherlock Holmes, I think I kin put yu next, but I don't think yure "wheels track" about de tuyers bein' to high, dats an old gag. I get forty letters every day wid de same spiel, put more shavin on yer bed an dont trow de pig iron on top uv dem put wood an coke in first, den take a soft hammer an pound de blast pipe wen de "big wind" goes on, 'cause de air gets cloged sometimes, 'bout de iron comin' to hot in middle uv heat, dats 'cause de sun moves 'round an shines in de chargin' door, put up a awing an yule clouse dat alright enough.

S. E. Attle.

A Piece-Work Incident.

During the panicy season some years ago when jobs at molding were as scarce as molders who will sit and tell you about all the bad castings they have made, I took the bull by the horns, and got in line with the Polacks and Slavs at a car shop foundry door, and after sneaking in was fortunate enough to get a job. The place was very large and employed a large number of men on the floors; fourteen flasks of almost everything was a day's work providing the pattern would fit in the standard-sized flasks. There was so much iron to melt in the cupolas that it was seldom we ever got out before seven o'clock, and were often as late as ten, although the blast usually went on at noon. Of course we were not molding all of this time, but we had to stay there all the same, and often we had occasion to ask if this method of running a shop was right or honest.

No one could defend the practice, but our only solace was that it could not last forever, so one day the foreman put me on another job, and told me on the quiet that there was a chance to make a little more money and get out early. I was delighted at this announcement, to be sure the job was piece work, sixteen little patterns in a flask, and sixteen flasks were wanted each day, a cent apiece or sixteen cents per flask, which made $2.56 cents a day; first iron, out of the shop at 3 o'clock, and you couldn't lose one of the castings unless you put your foot in the mold. This was a "snap," beat a jobbing shop all to pieces—was done molding at 11:30 and gone to dinner. I was going to follow car shops altogether after this.

At the end of the first week I went out to see how the Boss Chipper's account stood with mine, and learned that he was about 500 short. This riled me, because there was no redress; his account would stand. I complained to the foreman, who said the Chipper's account would have to stand, but ruled that in the future the Boss Chipper would have to come in and count 'em when they were shook out; so next day I stood the "bunches" on front end of floor. He came in, counted sixteen; next morning, when no one was looking, I carried two of the "bunches" and stored them on the back of the floor. That afternoon, when through shaking out, I carried the sixteen hot ones to the front of the floor, and the two cold ones also, so when Mr. Chipper came in and counted them he gave me credit for two bunches that were not made that day at all, and had been counted for me the day before. I kept this up from day to day for about twelve weeks, when the Boss Chipper told me the job was out. The patterns were taken away and I worked on something else, not quite so much of a "snap." A few days later the B. C. came in on my floor all excited, saying, "Where's the foreman, where's the foreman?" I thought sure I had been found out and would be discharged, but my fears were allayed when he told me that a mistake had been made somewhere, because they were about 2,500 castings short on the other order. Presently the foreman appeared and told me to run the other job until further notice. I had systematically skinned the company for $25, which I would never have thought of doing had there been a careful and correct account kept from the beginning. So the above amount is entered on my book to read that $5 is for castings lost, strayed or stolen, through carelessness of the company.

and the other $20 is marked up in the overtime column, even though they did keep us off the streets at night so that we couldn't be spending our money. C. RITTC.

Trade Papers vs. Circulars.

The tendency of manufacturers to use circular letters in place of space in trade papers is the result of a wrong idea of the value of a good name, writes U. V. White in the Northwestern Shoe and Leather Journal. The right kind of a trade paper is the adviser of its readers—it helps them over the hard places in business, it gives notice of new things and makes a relentless fight on fakes and fakirs. It is, first of all, a friend of its readers. This kind of a paper will not accept the advertisement of any concern which is irresponsible or fakish; this gives an implied good name to every advertiser. The business relations between persons introduced by a mutual friend are more cordial than those who meet because of the forwardness of the one who has something to sell. The trade paper will introduce any manufacturer or jobber to the class of business men he wants to reach. The introduction coming in the nature of an advertisement does not materially lessen the value of the introduction. The reader knows that the firm is responsible or it would not be allowed to advertise in this particular publication.

If each advertisement is written in the nature of a direct bid for trade, the trade paper advertisement will bring larger results than a circular every time. The average manufacturer, however, puts a standing card in the trade paper space and then supplements this advertisement with circular letters, and because returns come in he thinks the letters alone are responsible. Results come because his trade paper advertising has established his good name. A business man nowadays who gets a circular letter from a strange firm has to be mighty interested before he will give it any consideration. There's too many good and reliable firms to experiment with strangers.

It is also a fact that the irresponsible manufacturer, driven out of trade papers, has to resort to circular letters. For the legitimate manufacturer or jobber to try to compete with this class is foolishness. It is foolish for two reasons: He simply injures himself every time he notices this class; second, it costs too much in proportion to what can be taken out of it. Advertising with circular letters is one of the most expensive kinds of advertising.

Notes From Various Sources.

Stone, Fisher & Co., of Yokohama, Japan, write us that they are desirous of opening correspondence with manufacturers of foundry supplies and equipment with a view of introducing American methods into the shops of that country. They say that it is their policy to deal exclusively in American goods.

C. Martin, one of the foremen at the Shickle Harrison & Howard Iron Co.'s foundry at East St. Louis, Ill., is a much sought man these days. Three foundries have offered him a position as foreman, one of these being in Mexico, another in Canada, and the third in England.

The Sturtevant Engineering Company of London, England, has removed its offices in that city to 147 Queen Victoria Street.

The Low Moor Iron Company of Va., announces the appointment of Dalton, Nash & Co., 31 Burling Slip, New York, as exclusive sales agents for that company in the Eastern market. Mr. E. C. Means has been appointed general manager and will assume active charge of all manufacturing and mining operations.

The Whiting Foundry Equipment Company has withdrawn its agency from Mr. J. Gilmour in New York and vicinity, and will be represented in the future by Edward J. Etting.

The Standard Sand Company of Everett Ohio, have removed their main office to Cleveland, Ohio, and will hereafter be known as the Standard Sand and Foundry Supply Company.

The catalogue just issued by the Clayton Air Compressed Works, 26 Cortlandt street, New York, illustrates and describes the many types of Clayton Air Compressors, Air Receivers, Vacuum Pumps, Carbonic Acid Gas and High Pressure Compressors and the Clayton Air-Lift Pumping System. Among the other contents of this catalogue will be found full information relative to the transmission of compressed air and capacity lost by air compressors in operation at various altitudes. Copies of this catalogue will be forwarded upon application.

De Camp Bros. & Yule have been appointed exclusive agents in the St. Louis territory for the sale of the Dayton brand of pig iron.

The American Machinist Press of New York has issued a 400-page book, entitled "Questions and Answers From the American Machinist." As the title indicates, the contents have, at one time or another, appeared in the columns of the American Machinist. The book is compiled by Frank Richards, and contains a large number of references to the foundry business. Its price is $1.50.